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The effects of market and firm structure on the performance of food processing firms

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THE EFFECTS OF MARKET AND FIRM STRUCTURE ON THE PERFORMANCE OF FOOD PROCESSING FIRMS

by

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CHAPTER I. INTRODUCTION

In 1963 over 1.5 million people were employed in the food manufacturing industries.[1] The value added in food manufacturing exceeded $18 billion in 1963. This is more than 2.5 times larger than the same industries were in 1947 (80). Almost 20 percent of personal consumption expenditures were made for processed food in 1965.

There were more than 31 thousand companies primarily engaged in food processing in 1963 compared to 8.8 thousand in chemicals and allied products and 6.2 thousand companies in primary metals. Food manufacturing corporations accounted for 21 percent of the total advertising of all manufacturing corporations in 1962 (87, p. 66). Dollar sales of corporations in this sector of our economy increased by more than 76 percent from 1947 to 1962 while the dollar sales of unincorporated firms in the same sector grew by 4.9 percent (57, p. 8). In 1954 the 100 largest food manufacturers held four or more of the eight leading positions in 50 percent of the food product classes. This percentage control increased to over 70 percent in 1964 (57, p. 8).

These facts indicate the magnitude of the food processing sector of the economy. They point to the growth and structural change occurring

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[1]The Standard Industrial Classification will be used throughout the thesis. An industry refers to a four-digit classification containing a number of five-digit product groups. Three-digit classifications refer to groups of related industries. The following specific breakdown of industry groups will be used to study the food processing industry: meat products, 201; dairy products, 202; canned and frozen fruits and vegetables, 203; grain mill products, 204; bakery products, 205; other food companies; and companies producing food products but primarily engaged in nonfood activities.

in that sector. The food processing industries have developed from small local firms into networks of large conglomerately diversified manufacturers. Therefore, it is important to investigate the effects of these developments on the economic performance of these industries.

This thesis is a test of the contribution of selected structure and conduct characteristics of the firm and its primary industry to the performance differentials that exist among food processing firms. The measures of performance to be used are profitability and cost efficiency. Structural characteristics selected for measurement are industry concentration, size of the firm, diversified market power, and barriers to entry caused by plant and/or company economies of scale. Measures of conduct are represented by the amount of product differentiation and the amount of product diversification.

An industrial organization study should facilitate the understanding of the interaction and interdependancies of the structural environment with conduct and performance. This enhanced understanding should, furthermore, increase our perception of the working of a realistic market economy. The results of such a study should yield implications concerning the monopolistic performance of firms resulting from various market structures, company structures and forms of conduct and determine the value and appropriateness of structural dimensions as guideposts for antitrust policy.

The theoretical relationships involved in evaluating market performance are discussed in Chapter II. The data and methodology used to test these theoretical relationships and determine their strength are given in Chapter III. A look at the general characteristics of

competition in the food processing industry is presented in Chapter IV. The results of the statistical analysis are presented in Chapter V along with a critique of findings in other studies. Chapter VI summarizes the legal history of antitrust action relevant to the measures studied in the preceding chapters and builds a case for revised policy based on the results of the tested hypotheses.

CHAPTER II. REVIEW OF THEORY AND HYPOTHESES TO BE TESTED

The intent of this industrial organization study is to evaluate the competitive performance of the large firms making up a substantial segment of the food processing sector of the economy. The norms used to evaluate performance must first be evaluated in theoretical market situations. The actual measurement of market characteristics requires the use of indirect or proxy measures and thus, must be evaluated in accordance with the weaknesses of such measures.

Economic theory should, as Bain points out, (6, p. 22) (1) provide an analysis of the way the enterprise economy functions under a given set of structural and behavioral conditions, (2) explain why it functions in this manner, (3) predict how it will function under a changed set of conditions, and (4) evaluate the performance of the economy under different sets of assumptions on the basis of the contribution made by the economy in each case to the previously defined social welfare goals of the individuals in the economy.

In meeting these criteria society must provide the desired performance norms. Economic research should be used to evaluate the extent to which markets achieve these norms. In various oligopolistic market situations the underlying assumptions needed to evaluate this system are very stringent resulting in significant losses of generality in the results (8).

Thus in realistic industry situations, such as those confronted in the various food processing industries where numerous assumptions of existing theory are violated, the procedure must be one of hypothesizing

performance characteristics of firms under certain market situations in relation to firms in other market situations. The measured (cardinal or ordinal) deviation of the conditions existing among firms in one industry from similarly measured conditions for firms in another industry when other differences in the industries are accounted for can provide measures of the existence and type of relationships between industry structure and performance.

Market Performance of Firms

This study involves testing certain hypotheses that describe the expected relationship and influence of certain structural and behavioral conditions on the performance measures of firms that have been emphasized in modern theory and research. The firm is used as a basis for description because it is more legitimate to expect monopoly influences to show in the performance of firms, not in industry averages that encompass both monopolistic firms and those firms against which the monopoly power is being exerted.

Bain states that "...The essential limits of the performance of enterprises within a capitalistic economy are those of adjusting to whatever demands are present for their outputs, with the restriction that in so adjusting they must as a group at least break 'even'..." (6, p. 11). Price theory and general equilibrium theory, which consider this adjustment process, evaluate the performance of the adjustment on the basis of the level of production efficiency attained, the cost-price relationship, and the resultant income distribution. This approach does not take into account the ability of the economy to adjust to at

least three economic performance goals set by the political institutions, these being full employment, steady economic growth, and stable economic conditions. The triad of structure, conduct, and performance must then be evaluated at three levels, at the firm level, at the industry level, and at the aggregative economic level. If the performance goals at different levels are in conflict, society, taking into account legal feasibility, social and cultural preferences, must through such measures as antitrust laws adjust the conflicting goals. This thesis considers primarily the extent to which the performance of a firm is influenced by the structure of the market (industry) in which it participates.

It is not mechanically feasible to investigate all possible measures of performance in a study of this size and retain any ability to generalize over a sector so large as the food processing sector. Profitability, production efficiency and the adequacy of the scale of operations are considered here. These are measured at the firm and industry level. The stability and level of profits over time of diversified firms compared to nondiversified firms are the only measures of aggregative economic performance to be considered. The adequacy of each of these as a performance norm will be discussed in turn.

Profitability

Profitability achieves its importance as a measure of performance because it is the most readily available measure of the impact of market power on resource allocation. Productive efficiency as defined by the Pareto optimality conditions is achieved when any further reallocation of inputs would result in a reduction of output by at least one producing

unit. Utility is maximized when any further reallocation of commodities (including all items in the individual's utility function) would reduce the level of utility of at least one person. The joint efficiency or general optimality is achieved when rates of commodity substitution for all consumers are equal to one another and to the rate of product transformation for all producers. Perfect competition guarantees the existence of this condition of optimality (44, pp. 79-120).

If monopoly elements are present among the producers or sellers a price may be charged that would exceed marginal costs because the demand faced by each firm is no longer infinitely elastic but is downward sloping. Price, being a function of quantity sold under monopoly conditions, is now subject to the influence of the firm. It can be manipulated by actions of the firm, e.g., restricting output at a quantity below that of minimum average costs. Thus the ratios of the marginal products will no longer be equal to the ratios of the prices for the producers and the ratios of marginal costs will no longer equal the ratios of commodity prices for the consumer but will exceed them. A reallocation of inputs (or output) can be found that will increase the level of output (consumption) of at least one producer (consumer) without diminishing the level of output (consumption) of another (42, pp. 201-211). The degree of the misallocation of resources or welfare loss is determined by the divergence of price from marginal costs in the input and output markets, which is in turn determined by the elasticity of demand and the shape of the cost functions. One serious weakness in the Pareto system for determining a social optimum is that the resultant optimum is not independent of the initial distribution of income (45, pp. 215-281). In the current society

of the United States income distribution has become a matter of policy concern to the extent that legislation has been inacted to redistribute income in a more equal manner. Therefore, policy norms that are to be derived from welfare theory must go beyond the criteria of the Pareto optimum and pure competition to take into account this factor.

In an historical sense, differently defined concepts of workable competition have entered to fill this gap and to alleviate problems involved in the theory of second best alternatives. The theory of second best states that "...if an irremovable constraint is introduced into a general equilibrium model so as to prevent the attainment of one or more of the optimum conditions, the remaining conditions, although still attainable, are not necessarily desirable." (34, p. 15; 50, pp. 11-32). J. M. Clark stated that it is not true that satisfying more, but not all, of the presumed conditions will necessarily lead to a desired position (15, p. 241). As a substitute for the pure competition norm Clark introduced the concept of workable competition. To summarize, Clark maintains the existence of workable competition under the following circumstances: (1) If there exists small numbers of firms in a given industry there must be sufficient product heterogeneity accompanied with sufficient potential for commodity substitution to cause competitive response uncertainties; (2) there should exist a demand curve with sufficient elasticity to allow the firm to cover long-run average costs; and (3) there should be an active threat of potential competition from existing firms and new entrants (15, p. 241).

Stigler states that an industry is workably competitive when "...(1) there are a considerable number of firms selling closely related

products in each important market area; (2) these firms are not in collusion; and (3) the long-run average cost curve for a new firm is not materially higher than for an established firm." (76, pp. 2-3) Edwards and Sosnick give definitions of workable competition that represent more explicit breakdowns of Stigler's points (26, pp. 9-10; 72, pp. 380-423). These concepts of workable competition do not attempt to drive all factors to the assumed level of perfect competition but to a workable level of competition where there are sufficient numbers of producers and sellers to allow competitive pricing to function, excess profits or losses are not present to the extent that the consumer is jeopardized at the expense of the monopolistic producer, but profits are high enough to reward innovation, creativity, and risk. Therefore, long-run profit differentials that exist between firms should not entirely be the result of that firm's market share, structure, or any artificial barriers to entry that it may develop. Temporary differentials between the performance of various firms (and industries) should be expected for a number of reasons. First, the firms have varying abilities to cope with risk and uncertainty. Second, the firms in different industries have varying degrees of factor mobility and thus have varying rates of adjustment to dynamic factors. Third, the firms may have different levels of internal efficiency caused by the possession (or lack of possession) of scarce resources such as management. This could lengthen any temporary difference between one firm and another. Fourth, the competitive adjustment from one equalibrium to another causes differentials to exist. These are only a few of the factors that could cause temporary differentials.

Zimmerman has stated that market structure is a response to fundamental conditions of tastes and technology, while profits are merely the result of this response (95). He therefore concluded that antitrust action should not try to dispel monopolistic structure because the monopolistic structure grants stability (95, p. 5). However, Bain and others have shown empirically that production technology does not warrant the existence of a small number of large firms in each industry (5, p. 84; 68; 75; 93). If Zimmerman is accurate, it must be "tastes" that lead to monopolistic industry structure. But are the tastes of the entrepreneur in accord with the tastes of the consumer? If the entrepreneur is assumed to be a profit maximizer the answer must be only conditionally affirmative. The monopolistic producer may be able to increase profits at the expense of efficient resource allocation and consumer welfare. Therefore profit differences between firms should not be justified solely on the basis of the market share of that firm or the structure of the industry to which it belongs.

To summarize, as Bain points out, for a workably competitive system, short-term excess profits are justified and "therapeutic" for the economy to offset short-term losses encountered in depressing periods, to encourage expansion, efficient production, research and innovation, and to reward risk and uncertainty (6, p. 371). Chronic excess profits cause an inequality of income distribution by favoring enterprise owners at the expense of other recipients and by the undesirable impact on resource allocation among industries.

Excess profits will not be measured in absolute terms in this paper because of the problems of setting a competitive and appropriate profit

norm. A measure can be made of the effects of monopolistic structure on profit rates using various measures of market power and concentration to be discussed below. Various empirical studies have shown that certain relationships exist between average industry profits and industry structure particularly when accompanied with barriers to entry (7, 36, 57, 69, 92). These studies have not taken into account the effects of market power in diverse industries by the same firm. These studies have not measured the influence of market structure on individual firms. It will be hypothesized below that firms with diverse market power can use such power to stabilize profits.

The studies mentioned above have investigated the profit rates of one industry compared to another again with some measure of industry concentration as a dependent variable. A deviation from this standard, in which the performance of individual firms within concentrated industries is compared to the performance of individual firms in unconcentrated industries rather than the representative firm of a given size category, will allow a more direct test of modern theory. This approach is fostered by both economic and statistical logic. First, from the economic point of view the firm encompasses the decision unit, not the industry. Thus any profits that accrue to oligopolisticly structured industries should accrue in a somewhat like degree to those firms that are a part of the oligopoly. The individual firm would not desire to become a part of the oligopolistic structure if it did not achieve the levels of performance of the other oligopolists. Differences that may exist among the performance of various members of any market oligopoly (as

would be expected with an imperfect capital market, different management, etc.) are eliminated when industry averages are used. The effects of market and firm structure should be evaluated with respect to their impact on individual firms.

The statistical problem is again the problem of averaging. Using average industry profits as a measure of performance eliminates all within industry variation which may or may not overwhelm any between industry variation. This reduction in total variance increases the level of explained variance. The increase could be significant enough to give spurious levels of significance to relationships between variables.[2]

In an unconcentrated industry profits of firms of varying sizes should tend to be equalized if (1) there are close product substitutes and (2) low barriers to entry. In a monopolistic industry the profit rates of firms should be highly correlated with a measure of the firms' market power.

If monopoly profits are made by certain firms in an industry other firms may remain in the same industry making lesser profits because of the cost umbrella held over these firms by the price cost margins of the monopolistic firms. There may be no convergence of profits to any one level because of varying degrees of efficiency present among the firms.

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[2]This argument will be developed in more detail in a later section of the paper.

However, in the industries studied product differentiation exists which allows the firms to sell substitutable products in the same or different markets at different prices thus achieving different levels of profitability. Thus the extent of monopoly pricing by firms in these industries cannot be determined solely by the cross-sectional variation in the profits of firms within any industry.

If in a competitive industry, determined to be so by the existence of a large number of firms, the profit variation among the different firms at a given time is very small, there must be no unique optimum size of firm, i.e., no recognizable economies or diseconomies of scale for the firm. If in an industry determined to be monopolistic in structure by the existence of a few firms with significant market power, there is no significant variation in the profit rates between possessing market power and firms without signs of market power, the firms with the market power must not be using the market power to increase profits, i.e., they must be functioning competitively, or there must be little difference in the level of efficiency achieved among the various firms. Therefore profit rates should not be viewed in a vacuum but must be considered in conjunction with the performance of other firms (and industries) and the shape of the various firms' cost curves. Before discussing measures of costs, i.e., the efficiency of plants, an appropriate measure of profits must be selected.

None of the numerous measures of profit directly conform to the tastes of economists. The particular ratio used should fit the hypotheses being tested. The question being asked here is what effect do structural

characteristics that describe firms in monopolistically structured industries have on profitability? As was described above, excess profits indicate the existence of monopoly forces. Since excess profits cannot be practically distinguished from normal profits, the relationship of measured profit levels to other monopolistic attributes must be investigated. The profit measure should reflect the firm's ability to earn monopoly profits. But since monopoly profits are not being measured directly it is the differential levels of profit rates and their relationship to differential market structures that are important.

A ratio of net profit after taxes to net worth will be used in this study. Net profit after taxes is the lower limit of real profits. Real profits should be higher than accounting profits for the following reasons: (1) Part of the monopoly earnings may be paid in the form of excess officers compensation. This will keep reported profits below a level that would induce entry of new firms. (2) Depreciation, as a cost item, may not be a true reflection of the cost of capital equipment especially in periods where rapid write-offs are allowed. (3) Advertising has cumulative effects even though it is accounted for on a current cost basis. Possibly, advertising costs should be carried into future periods rather than written off in the year the investments were made. Net profit after taxes gives a measure of the firm's ability to earn money that can be retained for future expansion or passed on as dividends.

Net worth is a measure of the cumulative amount of funds that have been invested in the firm. This account provides a measure of the amount of funds that could have been invested elsewhere or, at least in part, distributed to stockholders. Therefore, it provides a base for

the opportunity cost doctrine. In the ratio form of net profit to net worth a measure of the net returns derived from the activities of this firm can be compared to net returns of other firms and other areas of production.

This ratio contains certain weaknesses as an accurate measure of profitability. First, net worth is an accumulation of past funds placed into the company thus being subject to unwarranted influence in periods of inflation and recession. Net profits are in current dollars therefore, not being affected in the same manner. The inflated base may not truly reflect the value of the firm. An asset base would contain certain degrees of the same weakness. Second, it was mentioned above that excess profits may be passed on in the form of excess executive compensation, wages, or advertising. These items appear as cost items in the accounts thus reducing the true level of profits. Third, accounting depreciation may not reflect actual capital costs since it is neither an accurate measure of capital used nor the obsolescence of capital caused by changing technology. Fourth, the relative ability of firms to earn profits may be affected by the effect of the tax structure on firms of different sizes. The after tax ranking of net profit to net worth based on size of assets is very similar to the pretax ranking based on size of operation and the differences between size classes are only slightly affected.

The ratio of net profit after taxes to net worth is an acceptable measure for the purposes of this study for another reason. Profit data for the food industries are presented in numerous forms by

Stekler (74). When ranked by assets size, profit rates reach a maximum in the $50 to $100 million asset category for all measures used by Stekler. Although absolute rates of profit vary under different forms of measurement, the relative differences between the profit rates of different size categories of firms do not change significantly. Therefore, the consistency of one measure becomes the important element in a study of the relative differences in the levels of profit rates and a ratio of net profit after taxes to net worth is at least as consistent as alternatives.

Efficiency of scale of operations

The second measure of performance to be used is the efficiency of the scale of operation or the cost efficiencies of various firms. Firms operating in a competitive industry should be forced to produce within a close range of the lowest cost level of output on the long-run average cost curve. If the cost curve is horizontal over a major portion of the levels of output, the industry could accommodate firms of varying sizes but the profit rate of such firms should be equal. The minimally efficient scale of plant defines the necessary level of concentration for the efficient functioning of an industry.

The distribution of profit ratios by size of firm has often been used as a measure of efficiency. The reasoning here being that a firm in a given industry that has a higher profit rate than other firms in the same industry must have cost efficiencies (1; 9; 61; 75; 86). The common fallacy in the use of profit rates as a measure of

efficiency is that the relation between profits and efficiency varies with the degree of competition. In a highly competitive market the relationship is a direct one. In oligopolistic or monopolistic markets higher profit rates may be the result of monopoly pricing, not efficiency in production.

Collins and Preston have used the price-cost margin in their studies of competition and monopoly in food processing industries (82, pp. 711-728). The price-cost margin is a measure of monopoly power and was found to have a high positive correlation with industry concentration (82, pp. 718-719). But this is neither a measure of efficiency nor of scale effects. The differential between price and cost does not give an indication of the absolute level of costs if monopoly elements are present.

Therefore a direct measure of the relation between costs and size of firm provides the most adequate measure of efficiency and scale of operation. Four categories of costs are used to distinguish the relationship of the costs of company operation to size of the operation. First, total costs of operation includes cost of goods sold, general administrative overhead, depreciation, interest, advertising and sales promotion, and taxes. Total costs, although it may contain some elements of monopoly profits, does not in this case include the normal profit concept of economic theory. This level of aggregation avoids many of the problems arising from different accounting systems and changes in accounting systems. Differences in the product mix of companies have a primary effect on the cost of goods sold, since this category contains most of the inplant production costs such as production labor,

inventories, and repairs and maintenance. The effect of product mix on efficiency is determined by examining the separate cost items, e.g., cost of goods sold, advertising, and general administrative overhead, to determine their respective minimum average levels with respect to extent of product mix and size of company.

The existence of economies of multiplant operation above those of inplant production economies would cause the average total cost curve to be downward sloping.[3] Output of a multiproduct firm must be measured in dollar terms. Therefore average total cost becomes the ratio of total costs to total revenue. With this unit of measure product prices are used as weights of product output; thus total revenue becomes the index of output and average total cost is expressed as cost per dollar of sales. A precedent for this procedure is found in determining total costs by weighting optimum input combinations by factor prices (13, p. 266). A similar technique was used by Douglas in deriving the elasticity coefficients used to determine the relationship between size of firm and the structure of costs in retailing (24). Using the IRS grouped data and using the average data within each asset size group, Douglas found an eratic movement in total costs. This was explained by the movement of the elements within the total cost curve, i.e., operating expenses did not reach a minimum at the same level of output as did cost of goods sold.

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[3]The nature of the total cost curve of a multiproduct firm will be discussed fully in the section on methodology.

A similar comparison of the cost components of food processing is presented here and related to size and structural parameters. The results of such tests should provide insights into the existence of scale effects in the industries studied. A discussion of plant economies is taken up in a later section dealing directly with barriers to entry.

This study does not represent an attempt to exhaust the dimensions of performance. It attempts to determine the relationship of profit rates and cost structures to certain characteristics of structure and conduct. Many of the measures of performance promoted by Sosnick (26, pp. 9-10; 34; 73; 76; 85) and others are considered in their general aspects and compared to other sectors of the economy but are not made part of the regression analysis.

The influence of risk and uncertainty is not being treated as a factor affecting the above mentioned performance variables. This could be a serious factor since all food products may not be affected equally by risk and uncertainty. First, it is assumed that they have all insured themselves against risk. Second, data limitation do not allow any further consideration of uncertainty in the cross-section analysis undertaken here.

Structural Measures and Their Effects on Performance

The most common indicators of the existence of monopoly elements have been the structural measures. The most frequently used structural measures are size of firm, delineation and size of the market and concentration. Bain has given the background for the relationships between structural elements and industrial performance that can be derived

from price theory. These relationships will be discussed in turn with each of the structural measures to be used in this study. It will be argued here that certain structural conditions are necessary but not sufficient conditions for monopolistic performance. The presence of certain structural conditions is indicatory of the existence of monopolistic elements. But the relationship between the structural conditions and levels of performance must be determined if monopoly or oligopolistic pronouncements are to be made.

Industry concentration

Measures of industry concentration are conceived as indicia of oligopoly power or market bargaining power. Oligop-ly and monopoly power derives from a relationship between buyers and sellers with the strength of such power depending on the number, size distribution, and conduct of the buyers and sellers. The concentration ratios commonly used are one-parameter indices of firm numbers and their size distributions in various markets which some economists say may be regarded as direct measures of the ordinal degree of oligopoly (70, p. 109).

The hypotheses of this research tend to support the concept that concentration ratios "...do provide an a priori basis, supported both by theory and experience for identifying markets containing significant elements of monopoly, although the extent and significance of non-competitive elements so located must be evaluated in each case by further study (35, p. 1263)." That is, high concentration ratios

signal attention to a particular industry but the relationships between high concentration and measures of performance must be tested to determine whether or not the market has functioned as a monopolistic market.

Scitovsky has outlined five effects, supported by theory, that would be expected in a monopolistic or oligopolistic market (70, pp. 102-110). First, monopoly power as represented by high concentration may have varying effects on income distribution. Some consider it inequitable for resources to receive more payment than is necessary to draw desirable quantities. Scitovsky considers income distribution to be one of the determinants of the flow of resources. Thus an income distribution that brings forth an efficient allocation of resources should be achieved (70, p. 102). Since concentration may allow monopoly prices and profits to be derived from the purchase of inputs and sale of output, incomes of certain groups of both consumers and producers are affected. It becomes more expensive and difficult to enter an industry and output may be restricted and sold at higher prices.

Scitovsky maintains that "The aim of all concentration,..., is monopoly profit; and therefore the best way of measuring concentration is to measure the extent to which it achieves this aim (70, p. 103)." Therefore, the hypothesis is being tested that states that there is a high correlation between profit rates and the company's primary industry concentration, i.e., concentration in the primary industry accounts for a significant amount of the differences in profit levels between firms in different industries.

Second, high concentration has an effect on the distribution of social and political power. The arguments here are similar to Galbraith's concept of countervailing power (37). The labor unions gain power to bargain with management, management bargains with the owners of capital. The balance of power in these bargaining situations

has an important influence on the balance of social and political power. The individual needs power to bargain against government, and this power might be derived from the socio-economic groups to which the individual belongs. Monopoly power achieved from the concentration of industries can manifest itself in political action. Therefore, this may be a socially undesirable aspect of industrial concentration. However, this type social and political aspect of monopoly is not tested in this thesis.

Third, the influence of concentration on monopoly power may have serious effects on the allocation of resources. In a competitive market resources are combined in the most efficient methods because of the price system which reflects relative scarcities and demands. In an oligopolistic market prices charged for outputs may be above marginal costs and prices paid for inputs may be below marginal value. Price is no longer a valid indicator of relative scarcities. Too little will be produced and too few resources will be utilized in these industries giving high profit margins. The existence of this condition is indicated by the hypothesized relationship that there is a high correlation between profit rates and concentration.

High concentration will affect the allocation of resources in a second manner. Since there is high margin between price and marginal costs, firms in an oligopolistic industry are not forced to use the most efficient methods of production. Once again, price does not represent the relative scarcities of inputs and the "socially most desirable" combination is not used. The results of the hypothesis

relating concentration to profit margins will not indicate the extent of the misallocation but only the existence of a system that does not enforce the most efficient allocation of resources.

Fourth, Scitovsky points out that "...profit maximization calls for efficiency in the internal administration and engineering setup of the firm, whatever the nature and structure of the markets in which the firm operates (70, p. 107)." To maintain a monopolistic position firms may charge an entry limiting price. This price, since it is below the monopoly price, will reduce the rewards for entry into the industry and thus establish barriers to entry (6, pp. 414-416). However, this could involve simple inefficiencies in the internal operation of the firm if by using the limit price firms do not adhere to the principle of profit maximization.

Fifth, oligopolistic market structures may not promote a rapid rate of technological progress. The inducement pertains to the dynamic mechanism while the prior factors referred to efficiency in static systems. There is some controversy concerning the actual direction of the effects of structure on technological change. First, only the well endowed firms, namely those receiving high profits, can afford costly R & D programs. In the more atomistic industries such as agriculture, technological progress has been developed by input suppliers, i.e., the fertilizer producers, insecticide producers, and universities. Second, innovation is a risky venture that only the profitable can afford. Thus, even if the firm is profitable enough to be inventive it is not assured of being profitable enough to be an innovator.

On the other side, Fellner states that "...A well-known proposition maintains that in a competitive industry newcomers enter with a new model (and force old firms to price below old total costs, according to the new method) as soon as new total cost falls short of old total costs, while a monopolist will adopt a new method only if new total cost is lower than old variable costs (32, p. 114)." Thus, progress should be slower under monopoly. This implies that new firms have some information and foresight not available to existing firms. This assumption does not seem to be valid nor does this reasoning account for the source of the funds to support the inventor. Therefore, there seems to be no a priori reason to expect one industry structure to exhibit a more rapid rate of technological progress than another (33, p. 556-577).

Tests were not made in this study to determine the various rates and divergencies in rates of technological progress in the food processing industries. There seems to be an indication that in meat slaughtering the innovated techniques have been adopted by the independents building new plants at the decentralized locations. However, the industry is not characterized by high concentration but decreasing concentration. Innovation by meat processors seems to be introduced by the medium sized processors. In baking, also a relatively unconcentrated industry, the large national concerns have been the innovators. In soybean and corn milling, both highly concentrated industries, the same holds true. In canning the large processors have innovated field operations partly in response to restrictions on hiring nationalist labor and partly in response to anticipation of an organized labor movement in the industry.

In flour milling no general statement can be made concerning the relationship between innovation and company size.[4] Therefore, there seems to be no general rule concerning the relationship between monopoly power and the rate of innovation in food processing. However, this point should not be considered closed to other researchers based on these non-empirical observations.

A number of hypotheses including those already mentioned can be drawn from the above discussion: First it is expected that there is a high positive correlation between industry concentration and average industry profit rates. Bain found that in a sample of 43 industries the average profitability on equity was high for the extremely highly concentrated and the very lowly concentrated industries (7, p. 313). Weiss found higher correlations between certain adjusted concentration ratios and average industry profits (92). The related hypothesis being tested in this research differs only in the sense that the relation is being tested between the profitability of firms and the concentration of the firms' primary industry. A positive relation is expected on the basis of the above discussion. The techniques used to test this hypothesis and other factors relating to methodology will be given in Chapter III.

Firms within a concentrated industry should experience higher profits than firms within unconcentrated industries regardless of the firm's relative size. The large dominant firms in a monopolistic

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[4]This information was obtained from discussions with industry experts at the U.S.D.A.

industry shield the smaller firms by holding a cost umbrella over them. In this way the smaller inefficient firms can survive in a monopolistic industry whereas they would not have this margin protected by the cost umbrella in a more competitive industry. This is directly related to the above hypothesis but the use of individual company statistics could indicate things left uncovered in industry averages. To uncover the possibility that large firms earn relatively equal profits regardless of their primary industry, a firm size variable was introduced into the study. This will be discussed below.

A second hypothesis flows from the concept of the cost umbrella. That is, if monopolistic power does exist and the cost umbrella is used to protect small competitors the variance of intra-industry profit rates should be lower in a competitive industry than in less competitive industry. In a competitive industry firms will be forced to price at or near marginal costs in the long run. Since there is little or no margin between marginal cost and price, exit of low profit or unprofitable firms will be rapid. But in a monopolistic industry the margin exists, therefore allowing firms of varying degrees of efficiency to remain in operation.

If there are no economies or diseconomies of scale in the company operation and all firms are equally efficient this variance test will not be a good indicator of monopolistic elements in an industry. However, there is evidence of some economies of scale in food processing at the plant and company level (68, p. 598; 93, pp. 258-259) and some evidence of diseconomies at the company level for some food processing industries (75, pp. 64-71). Secondly, it seems unrealistic to assume

that all firms in an industry have homogeneous management and personnel that allow for equal rates of efficiency, especially in light of the fact that profitable companies reward their managers in a manner that clearly indicates the scarcity of their particular resource. Therefore, the variance test should yield some indication of the existence of monopolistic markets in food processing.

Size of the firm

The absolute size of the firm presents a structural feature related to industry concentration but presenting a different set of expected relationships to performance. First, the absolute size of firm will have an influence on operating efficiency if either real or pecuniary economies of scale exist for the firm. These economies differ from in-plant economies in their relation to the overall functions of the firm. The larger firm may be able to draw capital at a lower rate. They may be able to more fully utilize R & D staffs. Small, and particularly, single product operations are limited in their ability to hire scientists and fully utilize the exploratory nature of scientific research. Multi-product operations, almost universally of a larger nature than single-product firms, can allow scientists to delve into a variety of research areas and utilize their skills.

Large companies are typically the largest advertisers. Thus, they can advertise on national media which increases the exposure of the advertisement per dollar spent and also qualifies the advertisers for the volume discounts common to advertising.

Large firms may also be able to purchase volumes of inputs that qualify them for volume discounts. Their size may give them enough bargaining power to permit them to make better deals on input purchases. These latter examples may all involve pecuniary effects but the effects could, in any case, explain some of the differences in profit rates.

There may be offsetting factors that need to be accounted for. First, classical theory has essentially assumed that after a firm reaches a certain size, management becomes so removed from the line operations that coordination and efficiency are lost. Secondly, large firms typically train their own personnel for specific functions within the company. Smaller companies that cannot afford such a training program must either accept lesser trained management or pay enough to attract those trained by the large companies. This charge should never rationally exceed what it would cost the company to provide such training on its own. This results in an inflationary effect on the wages paid by the large corporations.

These economies of scale for the total company operation should be reflected in the profit rates of the companies in the absence of monopoly (75, p. 55). Factors not directly related to the primary product of the company but related to its overall operation, e.g., the attraction of investment, should yield a positive relationship between size of firm and the firm's profit rate regardless of primary industry classification if such economies exist. Similarly, if economies exist that are peculiar to a particular primary industry the same positive relationship should exist between profit rates and size of firms within an industry.

This positive relationship between profit rate and size of firm could be caused by monopoly pricing and not economies of scale or efficiency. A comparison of average cost of operation to average revenue is needed to detect such pricing. If increases in the profit rate are not accompanied by declines in average cost, monopoly pricing must be present. This pricing element causes an increase in the margin of the company. In a competitive situation the company would be forced to lower price if efficiencies or economies are involved to capture an additional share of the market. In a monopolistic situation, it may be to the firm's advantage, even if efficiencies are involved, to maintain price, thus protecting smaller competitors, and permitting the large firm to gain monopoly profits. Thus a comparison of the shape of the average cost curve with the profit curve should give an indication of the pricing pattern of firms of varying sizes in various industry structures.

Barriers to entry

Barriers to entry reflect a characteristic of industrial organization within which elements of structure and conduct become intertwined. For instance, barriers such as large investment needs and scale of operations are a product of the state of technology. Those achieved via patents and copyrights are institutional in nature. Product differentiation, advertising and promotion, and pricing policy represent barriers to entry directly related to the conduct of firms.

Basically, a barrier to entry is present any time sellers in an industry possess an advantage over firms who wish to enter. The extent of the barriers determines the extent to which established firms are

protected from potential competition (6, pp. 237-238). Bain indicates that the barriers to entry may be measured by the percent to which price can be raised above the competitive level of average costs of production and distribution without inducing new entry (6, p. 337). This definition fails to incorporate Bain's later discussion of the effect of industry concentration. If industry concentration is not high there might be enough intra-industry competition to maintain near competitive price levels. If this is the case, barriers could eliminate the threat of new entry, but not seriously affect price margins. Therefore, barriers to entry are more aptly measured by capital requirements and control over resources (5, 41, 62, 75).

The major sources of barriers to entry that allow established firms to elevate price above the competitive level without inducing entry will be discussed in turn. First, the established firms may possess "absolute" superiority over new entrants derived from: (1) control over certain production techniques; (2) the build-up of market information not available to the "outside;" (3) the ownership of valuable resources, including management, labor, and equipment as well as natural resources; and (4) the availability of funds from sources unwilling to promote investment in a company moving into a new area.

Second, barriers to entry may result from economies of scale in production, distribution, management, and marketing and distribution. These economies may be real or pecuniary, but either case will present a barrier by requiring the new firm to capture immediately a significant share of the market if it is to receive the same rate of return as existing companies.

It is necessary to look at the scale effects at the plant and company level to determine their importance as capital requirements barriers to entry. It is believed that economies of scale in food processing at the plant level are limited in the sense that the minimum efficient size comes with a small percentage of industry output. The survival technique and engineering methods have been used in testing for production economies of scale in most of the food processing industries (68, pp. 91-100; 75, p. 54; 93, p. 246). The results of these tests will be presented later.

Economies of scale may accrue at the company level as well as the plant level. These scale effects could be the result of coordinated purchasing and distribution, full utilization of managerial talent, increased specialization of research and development staffs, and coordinated advertising and promotion. The data to be used in this study do not permit the separation of real and pecuniary economies. Pecuniary economies have the same effect as a barrier to entry as real economies so should not be eliminated from consideration.

The existence of any of these scale effects would cause the relevant cost curve to be downward sloping. Examination of the relevant cost per dollar sales will be made to determine the nature of the cost curves for the food processing firms.

Quantity discounts in mass media advertising are a significant factor in reducing the cost of advertising for a given exposure rate. Maximum volume discounts of 25-30 percent off regular rates are received by large volume network television advertisers. Smaller amounts are available in other advertising media (29, pp. 44-45). The large company

can also afford prime time advertising which provides a higher exposure rate.

Advertising presents a barrier to entry in three respects. First, advertising is a form of capital in the distribution process. This form of capital is more prone to uncertainty than buildings or equipment because its effects are unknown. Therefore, the company must be willing to place large volumes of finances in uncertain ventures.

Second, advertising has a cumulative effect on the market. Palda found that it took almost seven years for an advertising dollar to exhaust 95 percent of its sales generating potential (63, pp. 162-179). The cumulative effect of brand and special label promotion must be overcome by the entrant if he is to capture a significant share of the market.

Third, advertising is a means of product differentiation that creates brand preferences or company allegiances in the minds of consumers. This facit of advertising is more directly a measure of conduct than of market structure. Therefore it will be discussed in the next section.

In summary, it is hypothesized that the capital requirements of the plants of a company in its primary industry plus the capital requirements from the absolute level of advertising represent barriers to entry that allow the firms to receive a high profit rate. The cost structures developed in the research will be used to enforce this test.

Market Conduct and its Effects on Performance

Market conduct refers to those factors or influences that are specifically related to the internal policy of the firm, the manner in

which the firm relates to other firms, and the influence of these two items on the determination of pricing policies, output decisions, and the method of competition to be used. These factors are endogenous to the firm's operating model and thus under the control of the decision-making unit.

Two aspects of market conduct are presented in this paper: product differentiation and product diversification. Specific forms of pricing conduct are not considered although the results of such conduct are represented in the profit rates of the firms.

Product differentiation

Product differentiation is the process through which products of similar or identical uses are made different (1) in either quality, substance, or design or (2) strictly differentiated in the minds of the consumers by brand loyalty.

Emphasis is placed here on one of the many dimensions of product differentiation, namely that created by advertising. Advertising has long been considered an instrument used to subserve the competitive functioning of the market. In recent years advertising has drawn increased attention by economists and policy makers as a noncompetitive tool. The latter aspects are of importance here. Of particular concern are the effects advertising could have on the maximization of consumers' satisfaction which "...has traditionally been regarded as the primary criterion for evaluating the economic system (35, p. 1257)."

Advertising may be undertaken by a firm for any one or a combination of the following reasons: (1) to expand the market for the product;

(2) to expand the firm's market share; and (3) to change the shape of the demand curve. Thus advertising may take one of three forms: (1) a purveyor of price, quality, and physical appearance information; (2) a means of persuading consumers of product differentiation merely on the basis of its being produced by a certain enterprise; and (3) a barrier to entry.

Money spent on informative advertising raises no issue regarding anti-competitive effects. The exposure to more price and quality information can only enhance the maximization of consumer preferences and the functioning of a competitive system.

The barrier to entry aspects of advertising, discussed above, are felt mainly through the increased capital required to overcome the cumulative effects of firms using high absolute levels of advertising.

Persuasive advertising and promotion create barriers to entry and "...violate(s) the principle of consumer sovereignity by the deliberate(ly) use(ing) (of) resources to change consumers' tastes...and by limiting consumer choice through the progressive substitution of nonprice for price competition (35, p. 1259)." Bain states that:

> "Persuasive promotion...and its costs are basically wasteful, and more so as they become larger. (A) large proportion of observed promotion activities and costs have, to all appearances, a dominately <u>persuasive</u> orientation, and this relative emphasis is generally greater as selling costs are larger in proportion to sales. It is common to industries with costs equal to five percent or more of sales revenue...that nearly all advertising effort...has a persuasive...orientation. All or most of the industries with relatively high advertising costs are seriously suspect of...(unworkability) in the sense that wasteful promotion costs have exceeded the 'limit of tolerance' or 'margin for error' which should probably be allowed in making normative evaluations... (73, p. 117)."

Although it may be difficult to draw a sharp demarcation between informative and persuasive advertising, it is clear that a large portion of television and magazine advertising reveals no price information and little beneficial quality information. Clearly when a new product is introduced in the market it needs more promotion than established products. It needs to be familiarized in the consumers' minds. But after this has been accomplished, promotion can be reduced to concentrate on price-quality information.

Since 1950, advertising expenditures have risen more rapidly than GNP. Total expenditures in 1965 were 165 percent higher than in 1950. Television advertising has increased by 15 times the 1950 level (46, p. 28). Among the products most heavily advertised are packaged soaps and detergents with a four-firm concentration ratio of 79 percent; razor blades, 97 percent; dentifrices, 83 percent; tires, 75 percent; and chewing gum, 79 percent (46, p. 28). Professors Wilson and Comanor of Harvard University found in a recent study (as yet unpublished) that industries with "...high advertising outlays exceeded by nearly 50 percent the average profit rate of the 41 consumer industries studied (46, p. 28)." John Blair, chief economist of the Senate Antitrust Subcommittee found that of the 36 consumer industries and product classes which spent $250,000 or more on advertising in 1965, 25 have had an increase in concentration. In addition to these factors there is no indication of the amount of persuasive advertising that is cancelled by similar efforts of rivals and hence wasteful of resources.

Telser found, in his study of the relationship between advertising and competition, that "there is little empirical support for an inverse

association...between the two factors (79, p. 558)." This conclusion is based on the weak correlation between the four-firm concentration ratios and the ratios of advertising to sales. It has been pointed out that concentration, although an accepted measure of monopoly is only one aspect of structure rather than being a complete measure of market power (17, pp. 6-8). Therefore, the conclusion of Telser should not be made until the effects of advertising on performance are known.

Secondly, Telser examines the relationship of advertising to the stability of market shares but uses brands rather than firms in his tests. Finding that high advertising is associated with relatively unstable market shares of brands, he suggests that the hypothesis that advertising protects market shares from competition be rejected (79, p. 547). He never considers the relationship between "...high advertising expenditures and rapid new product or brand introduction and the stability of market shares of firms (17, p. 8)." Thus the instability of brands within a firm may not necessarily reflect instability of the firm's market share.

It is hypothesized that a high absolute level of advertising over a period of years and a high advertising to sales ratio create barriers to entry that are reflected in high profit rates in addition to those presented by production economies.

Tests of the influence of advertising are particularly significant in the food processing sector of the economy since the firms in this sector (excluding alcoholic beverages) accounted for about 12 percent of all corporation advertising and about 21 percent of all advertising by

manufacturing corporations. Between 1950 and 1964 advertising expenditures by food manufacturers increased over 300 percent from $435 million to $1.4 billion. The rate of increase was one-third greater than the average for all U.S. corporations (58,p. 65). Total advertising of the firms in food and kindred products (except alcoholic beverages) greatly exceeded that of tobacco manufacturers, petroleum products, and motor vehicles and parts manufacturers (58,p. 63).[5]

This high absolute level of advertising is concentrated in a few firms. Roughly 44 percent of the total spent on advertising food products was spent by the 20 largest companies in 1964. The 50 largest accounted for in excess of 80 percent (58,p. 65). In the same year the 20 largest food companies accounted for over one-half of all television advertising of food products, 71 percent of network television, and 60 percent of magazine advertising of food products (58,pp. 66-67). These percentages have greatly increased since 1954. It is also of interest to note that these 20 companies accounted for 28 percent of food product sales, which is significantly lower than their percentage of food advertising (58,p. 66). This disparity between concentration of sales and concentration of advertising is further exemplified by the following table.

Although it is not conclusive evidence, the discrepancy between the two measures of concentration (sales and advertising) indicates the need for treatment of these measures as separate dimensions of market power.

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[5]However, it should be recognized that food and kindred products is a 2 digit classification, tobacco a 2 digit, petroleum products 3 digit, and motor vehicles and parts a 4 digit classification (58, p. 63).

Table 1. Share of value of shipments and advertising in measured media accounted for by the 4 largest companies of selected food manufacturing industries, 1963[c]

(Percent)

Census industry	Share of national industry shipments made by the 4 largest companies	Media advertising expenditures of the 4 largest companies				
		Magazines	News-papers	Network TV	Spot TV	Total measured media
Food products, average	46	72.9	48.7	85.2	74.7	77.1
Meat products:						
Prepared meats	14[a]	61.0	48.7	100.0	28.0	45.4
Poultry dressing	14[a]	----	----	----	----	----
Dairy products:						
Natural and processed cheese	44[a]	89.5	86.0	100.0	96.4	94.6
Condensed and evaporated milk	40[a]	98.6	82.9	100.0	100.0	98.9
Ice cream and frozen dessert	37[a]	55.8	84.8	100.0	86.6	84.4
Fluid milk	23[a]	53.2	48.6	77.1	49.4	54.5
Canned, preserved, and frozen food:						
Canned and cured seafood	48	43.2	55.9	100.0	92.6	85.9
Canned specialities	NA[b]	92.9	97.2	91.3	99.2	95.0
Canned fruits and vegetables	24[a]	46.7	73.5	50.7	25.0	49.5

[a]1963 concentration ratios; remaining figures are for 1958, as 1963 figures were not available.

[b]NA Not ascertained.

[c]Source: (58, p. 75)

Table 1. (Continued)

Census industry	Share of national industry shipments made by the 4 largest companies	Media advertising expenditures of the 4 largest companies				
		Magazines	News-papers	Network TV	Spot TV	Total measured media
Dehydrated fruits and vegetables	37[a]	47.2	40.2	59.0	75.6	58.2
Pickles and sauces	35	26.0	18.6	63.0	53.3	42.3
Fresh and frozen packaged fish	18					
Frozen fruits and vegetables	24[a]	46.1	63.4	78.3	48.8	58.7
Grain mill products:						
Flour and meal	38	100.0	95.8	100.0	90.1	95.1
Breakfast cereal	83	80.0	81.1	75.1	90.4	82.8
Rice milling	43	75.7	97.6	100.0	87.7	91.2
Blended and prepared flour	67	94.7	96.0	97.9	95.3	96.2
Bakery products:						
Bread and related products	23[a]	51.1	53.8	22.1	73.0	64.2
Biscuits and crackers	59[a]	93.2	78.1	100.0	61.5	89.3
Sugar:						
Cane sugar refining	69					
Beet sugar	64	76.1	83.9	None	87.1	85.0
Candy:						
Confectionery products	18	82.8	70.2	46.8	65.2	67.4
Chocolate and cocoa products	71					
Chewing gum	88	100.0	78.5	100.0	100.0	99.9

Table 1. (Continued)

Census industry	Share of national industry shipments made by the 4 largest companies	Media advertising expenditures of the 4 largest companies				
		Magazines	News-papers	Network TV	Spot TV	Total measured media
Soft drinks:						
Bottled and canned soft drinks	75[d]	85.0	72.2	88.1	84.2	83.3
Flavorings	55					
Oil mills:						
Shortening and cooking oils	42[a]	94.1	90.7	97.6	89.9	92.1
Margarine	46	81.3	84.[illegible]	100.0	81.6	85.2
Miscellaneous foods:						
Potato chips	35	100.0	66.3	100.0	80.4	81.6
Roasted coffee	46	40.4	61.5	90.2	56.3	60.0
Macaroni and spaghetti	25	80.6	69.7	93.2	45.0	64.3

[d]Sales concentration ratio including sales of franchised bottlers. See Chapter II.

Absolute size of advertising expenditures is then a measure of advertising as a barrier to entry. Size of firm measured by sales volume is a separate dimension of market power.

The hypothesis is tested in this study that there is a high positive correlation between both absolute levels of advertising and the percent of sales revenue devoted to advertising and the profitability of firms. Other differentiation activities--promotion, packaging, etc., will not be considered.

Product diversification

There must be some debate whether diversification is truly a measure of conduct or should be considered a structural change. Diversification is considered a measure of conduct in this research for two reasons. First, diversification has no immediate impact on the structure of any one market. The structural change brought about by diversification is at an aggregative level; it spreads across market lines. Therefore, this form of structural change is inconsistent with the other structural variables considered in the paper. Second, diversification is completely under the control of the firm. The decision is made by the firm whether or not to enter a new product line or a new geographic market and in turn whether this be accomplished by merger or internal growth. Diversification of product line or geographic market is as much a matter of firm conduct as differentiation of a product.

Definitions

In the realm of industrial development the firm has essentially three avenues of growth; horizontal; vertical; and conglomerate.

Each of these may be pursued by either internal means of expansion or by merger (where merger indicates any type of purchase of any part or the whole of the assets or stock of another enterprise giving the purchasing firm control over the purchased enterprise).

Horizontal growth is the expansion of an enterprise's capacity in its primary product line. The increased output of the firm is viewed as identical or highly substitutable for its primary product. The motives of such expansion, whether by internal growth or merger, may be to achieve a larger market share to gain increased market power, to achieve economies of scale in production or distribution of the product, or merely to meet growing demand for the product being produce.

Vertical growth is the expansion either forward into the activity usually performed by the buyer of the enterprise's product, or backward into the inputs used by the enterprise in its primary production. This type of growth may be undertaken to insure a continual supply of inputs or intermediate products, to gain control of vital inputs or market outlets, or to achieve economies that make the vertical operation cheaper for the firm than if it were to purchase these inputs or services in the market.

Conglomerate growth, or growth by diversification, bears no clear cut definition. Pure diversification is the movement into completely unrelated areas. But there are few cases of this form of diversification since at some level of company operation--the procurement of inputs, production, or distribution, or in the more aggregative sense, the competition for labor or capital--the diverse product line bears a

significant relation to other products of the firm. Antitrust enforcement has relied on the use of a strict definition for horizontal and vertical mergers and left the residue of cases fall into the category of conglomerate mergers (67).

The following definition of diversification will be used in the context of this paper: diversification results in the production of a product by a firm that is not a close substitute of the firm's primary product in a vertical or horizontal nature. The 4-digit Standard Industrial Classification is used for analytical measurement of diversification after taking account of vertical integration.

There are at least three weaknesses in this measure. First, the degree of "node commonality"[6] cannot be measured directly by such a classification scheme. Some of the influence of varying degrees of product relatedness is accounted for by considering various alterations of the 4-digit SIC.

Second, there are differences in the volume produced and relatedness of products within 4-digit industry groupings. Thus each 4-digit industry is not a clean homogenous group of products. Some industries contain a wider group of products than others. As would be expected from this some industries account for a much larger volume of output than others.

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[6] If each firm is viewed as a collection of elements "each of which has some output or capacity" and "if we designate each location of an element" along a spectrum, ranked by relatedness, as a node, then "the degree of product relationship is the degree of node commonality that exists" between the various activities of a firm (56, pp. 3-7).

Third, there are instances where the product grouping within a 4-digit industry may be questioned. A few industries contain products sold in different markets than the majority of the products in the industry.

In view of these weaknesses, the 4-digit industry classification is used because (1) it most clearly represents the node commonality desired for this study and (2) data identifying primary products of firms and industry concentration are most readily available at this level of classification.

Diversification may also take the form of market extension. This is defined as the movement, by a firm, into a new geographic market with a product previously produced by the enterprise. Diversification via market extension is not considered separately here. All markets are considered to be national markets for purposes of concentration measures. In the realm of food processing this assumption is most seriously violated by the dairy and bakery industries. Studies have indicated the existence of negative relationship between regional industry influences and profit rates which indicates a downward bias of national concentration ratios (17, pp. 31-32; 82, pp. 720-721). Since data are not available that would permit a meaningful measurement of geographic market extension, the influence of this facet of firm conduct or performance is left in the unexplained error.

Diversification must be considered from two points of view. First, what are the reasons for product diversification within an enterprise and are these reasons fulfilled? Second, what are the effects of product

diversification on market performance? Each aspect will be considered in turn.

The reasons for the pursuance of any activity (or form of conduct) endogenous to the firm must be tied to the objectives of the firm. Therefore it is necessary to choose a central objective common to the firms under study. The firms are assumed to be pursuing the goal of long-run profit maximization. Although firms may have numerous short-run goals and even varied long-run goals, profit maximization seems to play a critical role in the long-run decision model of the firm (51, 8).

Specifically, diversification will be considered a means to increase the level of profits, increase profit stability or reduce risk, a general outlet for investments, and a means to achieve market leverage.

Diversification can influence the level of profitability in two ways: first, by the channeling of capital into more profitable areas; and second, by permitting the firm to more fully utilize resources.

The firm may find that demand conditions for its primary products have shifted or the cost structure has changed to reduce the level of profitability of producing such a product. There may have been no change in the marketing conditions of the firm's primary product but new products may have entered the market that yield a higher return on capital or a rapid growth rate. These are only two reasons to encourage a firm to diversify into new product lines. Diversification may be the dynamic mechansim by which competition funnels capital of an existing firm into more productive and higher profit areas of use.

Physical rigidities and the immobility of capital do not allow large firms and particularly firms that contribute a significant share of the output of an industry to move in and out of the production of certain goods at will. Once capital has been committed to the production of a particular product it cannot be reversed and moved into other areas in the short run. Therefore, rather than move entirely into the new area the primary product of the firm is maintained as a base.

The base of operation provided by the primary product is used by the firm to provide liquidity for moves into new areas. The firm must have liquidity if it is to obtain capital or make investments in new areas whether this move be accomplished by internal expansion or merger. A firm may, and very often does, have ample liquidity even in view of declining profits. The firm will hold liquid assets during a period of declining profits in anticipation of an opportunity to invest in higher profit areas (82, pp. 196-197).

Diversification that permits fuller utilization of resources or the realization of economies of scale is related to the achievement of higher profits through cost reduction and the perseverance of the primary product line of a firm.

The latter factor will be taken up first because of its obviousness. If the firm has diversified to achieve cost reductions of some nature through the joint procurement of inputs or through the production and marketing of joint products it would be reductio ad absurdum to discontinue the production of the primary product.

Economies of scale or cost reduction via more efficient utilization of resources are not so readily conceived when their achievement is derived

not from the increased scale of a particular product but through the production of differing products. Such gains might come from the adaptability of capital during slack periods for a certain product to production of related products. But it is more conceivable that the gains be in management and nonproduction personnel, procurement, marketing, and research and development.

Expansion by merger is often considered a method of purchasing management (82, p. 188). However, the ability of existing management may be spread into new enterprises or operations without detracting from the primary function of the company. The same may be true for sales personnel. If the products are marketed through similar channels the existing firm may have a great advantage over a new entrant or a single product firm in its ability to use its existing sales force to promote a number of products with the same resources.

If the products are produced from similar inputs, the extension into a new product may allow volume purchases that permit the company savings on a per unit basis for both product lines.

Many facilities may be utilized by both products on the marketing end of the spectrum. If the products are sold through similar or identical outlets the same transportation facilities may be utilized. More significantly, the products may be promoted and advertised jointly. The unit cost reduction from large scale advertising was discussed above. Similar savings are derived from promotional schemes such as the joint mailing of coupon offers.

Research and development personnel are able to delve into and follow lines of research that might have no future if the company produced

a single-product line. The findings of research are by necessity unpredictable. Only if the company is willing to diversify can a number of the results of R & D efforts be used.

In addition to the direct attempt to increase profits by diversification, the enterprise can, if the diversified activities are properly chosen, reduce risk of abnormally low profits. An analogy may be drawn here to the diversification of an asset portfolio (53). Risk is typically measured by the variability of returns over time. The measure to be used here is the variance of the ratio of net profit after taxes to net worth.

If r_i are the random variables representing the possible outcomes for each of i = 1,2,---, N diversification moves, s is the sum of these returns, and w is their average, risk will be reduced with no accompanying reduction in the profit level under the following conditions:

1. $r_k = r_j \ \forall r_i$
2. Cov $(r_k , r_j) = 0 \ \forall r_i$
3. Var (r_k) = Var $(r_j) \ \forall r_i$

Then the expected value of the total return, s, is

$$\text{expt (s)} = \text{expt } (r_1) + \text{expt } (r_2) + \text{---} + \text{expt } (r_N)$$

$$\text{or expt (s)} = N\,E,$$

$$\text{where } E = \text{expt } (r_1) = \text{expt } (r_2) = \text{---} = \text{expt } (r_N).$$

The expected value of the average return, w, is then equal to: $\frac{\text{expt (s)}}{N}$. Therefore, under the above assumptions the average return is not reduced by diversification.

The variance of the total operation, s, is

$$\text{var (s)} = \text{var } (r_1) + \text{var } (r_2) + \text{---} + \text{var } (r_N)$$

but since equal variances are assumed,

$$\text{var}(s) = N\,\text{var}(r)$$

then the variance of the average of the portfolio is,

$$\text{var}(w) = \left(\frac{1}{N}\right)^2 \text{var}(s).$$

Substituting we have $\text{var}(w) = \frac{\text{var}(r)}{N}$.

Thus the variance (risk) approaches zero as N increases, i.e., the number of uncorrelated activities are added to the operation of the enterprise.

Again to parallel the argument of Markowitz the assumptions will be relaxed to fit the situation of product diversification.

First, this proof assumes that the returns, the variance of returns, and the covariance of returns are predictable or can be assigned objective probabilities. Entrepreneurs must base their predictions on probability beliefs which are subject to error. There may, in addition, be autocorrelated errors increasing in magnitude as the number of diverse activities increases. This is similar to diseconomies of scale in prediction. With one product line the company need predict only the market events relating to that particular line. With two product lines the company must predict the market events of both product lines and the interaction or covariance between the two. Because of the need to predict the covariance of the returns of every product with every other, the time and cost of prediction will necessarily increase geometrically. Therefore, even though the gross return may not be lowered with decreases in risk through diversification the net return may very well be diminishing because of the increased entrepreneural time required.

Second, the returns on each operation or product line are not equal. Therefore, the expected value of the average is unequal to the expected

value of r, the return on each line. The expected value of the average return or the return on the combined operation, w, is now:

$\text{expt } (w) = \frac{1}{N} \text{ expt } (s)$.

Thus, the expected return will be altered by diversification, but since the variance of the returns is independent of the level of returns, diversification still brings increased certainty.

Third, the variances of return on all operations are not equal in manufacturing. With unequal variances it is possible that the profit variance of the enterprise may not approach zero if the variance of the successive additions exceeds some upper limit. If this upper limit is defined by var (L), then,

$$\text{var } (s) = \text{var } (r_1) + \text{var } (r_2) + \cdots + \text{var } (r_N).$$

By the assumption that none of the variances exceeds var (L),

$$\text{var } (s) \leq N \text{ var } (L).$$

The variance of the average, w, is then

$$\text{var } (w) = (\frac{1}{N})^2 \text{ var } (s)$$

which must be less than or equal to $\frac{\text{var } (L)}{N}$,

or, $\text{var } (w) \leq \frac{\text{var } (L)}{N}$.

Thus, as N increases, $\frac{\text{var } (L)}{N}$, approaches zero, so var (w) also approaches zero. This proves that with unequal variances, product diversification can reduce the total risk, but the upper limits on the permissible variance declines as the number of diversified activities increases.

Fourth, the assumption that the returns on different product lines are uncorrelated must be relaxed. This assumption is particularly involved in product diversification where numerous moves are into product lines closely related to existing product lines (39, pp. 27-64; 56; Chap. I, II).

If the average covariance is defined by the sum of all distinct covariances divided by the number of distinct covariances, the average variance can be represented in the following form:

$$\text{var } (w) = \frac{\text{var } (s)}{N^2} + \frac{2\Sigma \rho_{ij}}{N^2}$$

where ρ_{ij} is the covariance of the ith returns with the jth. But as N increases, with var (r_i) < var (L), $\frac{\text{var } (s)}{N^2}$ approaches 0. Therefore, as N increases the variance of the average return approaches the average covariance. Risk can then be reduced to a certain level, the average covariance, by diversification in the presence of non zero covariances.

The a priori expectations relating to product diversification that can be derived from the Markowitz model are that by the accurate evaluation of uncertainty and the proper selection of product lines an enterprise can (1) increase profits and (2) reduce profit variance or risk by product diversification. If this is the case, diversified firms will have higher and more stable profits than non-diversified firms and the variance of returns will decline as the firm adds product lines.

Gort investigated the hypotheses relating the cyclical fluctuations of the different product lines added to the frequency of product line additions. Two measures were used to describe cyclical fluctuations. First, Gort used the Chi-square to test for any relationship between the number of changes in direction of the annual output indexes for particular products, the frequency of product additions falling into one of his three ranges of turning points. Second, a Chi-square was used to test for any relationship between the cyclical amplitude, measured by

averaging through to peak and peak to through changes in the annual output indexes, to the number of product additions falling into his three ranges of cyclical amplitude. In both cases he found the relationship to be one of a high number of product additions in cyclically unstable product lines (39, pp. 113-117). This is not strong evidence which a conclusion concerning the effects of diversification on profit rates or stability should be based. But it does indicate that firms might for some reason choose product additions having variance of returns greater than the upper limit (var (L)) described by Markowitz.

Gort found that besides choosing product lines that were not particularly stable, the firms choose (1) areas of relatively high technological change and (2) areas requiring a large average investment (39, pp. 103-134).

The hypotheses described above will be tested here by relating profit variance of diversified firms to that of single product firms over an eighteen year period. Second, a comparison will be made between the variance before and after diverisfication on a small group of firms where the change in product lines can be distinguished.

Large firms may find it undesirable or non-contributory to their goal of profit maximization to invest all funds in their primary industry for two reasons. First, demand for the primary product may not be growing rapidly enough to accommodate the increased capacity created by new investment. Second, legal restrictions have placed limitations on certain forms of horizontal growth more severely than on diversified growth. Diversification provides an outlet for investment funds that bypasses either of these two problems. The problems will be taken up in turn.

The first problem is a simple capacity problem. The large firms who can afford to move into other product areas often do so if their primary industry is slow in growth or sensitive to excess capacity problems. In some industries a few large firms make more total investment in numerous areas than is made by all firms in their particular primary product line. Diversification provides an outlet for the funds of these large and often highly liquid firms.

Second, it has been emphasized by a number of companies that it is cheaper to expand by merger than by internal expansion. There are restrictions placed on growth by merger, particularly horizontal merger, by the antitrust laws. These restrictions will be covered in detail in Chapter VI, but at this point it can be said that mergers in industries that have had a tendency toward increased concentration and mergers involving upwards of 30 percent of a market will be protested by the antitrust agencies. The rule of law is less distinct and certainly less rigid toward product extension and conglomerate mergers. Therefore, firms who might otherwise grow by horizontal mergers are taking the path of diversification to avoid antitrust litigation.

Market leverage, which may be achieved through diversification bears different definitions by different writers (25, pp. 331-352; 56, pp. 105-115; 75, pp. 54-71). It is considered here as the situation in which a firm may achieve power in one market because of its activities in other markets. This leverage may be achieved and used in a number of ways. It may be the temporary shifting of financial resources from one product to another when that particular product needs additional promotion or new features that might be developed through R & D.

Market leverage may be achieved by full line selling. The buyers may find it more attractive to purchase various products from fewer salesmen. Or the manufacturers may promote certain product lines by selling other products at a discount when purchased in combination.

The essence of market leverage is that it allows the multiproduct firm to compete in a manner not open to the single product enterprise. The multiproduct firm can use the factors mentioned above to squelch competition. In addition, it can, in the short run, subsidize a product line that is temporarily under the impact of intensive competition, by the use of profits from other product lines. The firm would not subsidize a product over the long run unless the product provided something in return to the other products, e.g., complementarity or a quasi tie-in arrangement.

The extent to which market leverage has a positive influence on profit rates should show up in a test of the relationship between profits and an index of diversified enterprise power. Such an hypothesis is tested using enterprise profit rates and an index of market power discussed in the following chapter.

Effects of Product Diversification on Market Performance

Four of the means through which diversification may have an effect on market performance will be considered: the spread of monopoly power; the ability to use reciprocal trade agreements; increased enterprise efficiency; and increased market leverage.

Spread of market power

The spread of market power is closely related to the attainment of market leverage. The firm may be restrained from achieving further monopoly power in one industry by the antitrust laws. It then funnels its growth potential into other industries. If this firm is large, and has vast financial resources, it may shift this power to a different product line by merging with a dominant firm in that industry. Examples of such cases are the mergers of Procter & Gamble with Clorox, and Reynolds Metals with Arrow Brands. In both cases the firms (P & G and Reynolds) were large, dominant firms in their primary industries. The firms with which they merged were also dominant in their respective industries but lacked the resources made available to them through the merger. The merged firms were much larger than any other firms in the industries of the purchased firms and thus had the potential to build resources and market strength to stifle any competitive effort that might be promoted by smaller firms.

It is hypothesized that because of this diversifed market power, there is a positive relationship between the level of profits and the extent of diversification. This market power is manifest in monopolistic activities that are measured in higher price-cost margins and higher profits.

Reciprocal trade agreements

The diversification of an enterprise may be patterned in a manner that allows the firm to increase sales by the use of reciprocity (55, p. 73; 78, pp. 1386-1393). Reciprocity is the process by which

companies place high priority on purchasing from companies that have in turn purchased from them. This action becomes significant when the large diversified firms in oligopolistic industries meet one another in different markets. There becomes a practice of considering "purchase credits." A company will consider that every purchase it makes from another company earns it a purchase credit in return.

More candidly, firms may diversify in a pattern that forces processors in the middle to purchase intermediate products from their company if they wish to sell the company end products.

Consider the case where industry A sells product A to industry B; industry B sells product B to industry C. If a firm in industry C gains a significant share of the output of industry A, either by merger or internal growth, firms in industry B are effectively "boxed in." The firm in industry C may require the firms in industry B to purchase product A from its division in industry A if they wish to sell their products to this firm in industry C.

To quote Turner, "...it may be stated flatly that reciprocity, even more than the tying arrangements it so closely resembles, has little or nothing to be said in its favor (78, p. 1388)." The effectiveness of competition depends upon the effectiveness of price competition and the buyer's sovereignty in choosing among various grades of quality, service, etc. Reciprocity clearly distorts this system. Rationally, firm B would not enter into purchase agreements with A and C (assuming that industries A and C are not controlled by one firm) unless the purchase credits earned by B can be used to its advantage. But if this is a profit advantage it represents a private advantage and not necessarily a social gain.

This form of reciprocity that distorts the competitive market mechanism can be achieved through product diversification.

In summary, it is hypothesized that firms diversify to increase profits, increase efficiency, increase profit stability or reduce risk, and as an outlet for investments. The means through which diversification can achieve these goals are the spread of monopoly power, the achievement of market leverage, and increased use of reciprocal trade agreements. The methods used in testing these hypotheses are discussed in Chapter III.

CHAPTER III. METHODS AND DATA USED TO TEST HYPOTHESES

The hypotheses described in Chapter II need to be separated into those tested with cross-section analysis and those tested with time series analysis. The variables and data used to derive these variables will be discussed in this chapter along with the statistical testing procedures used.

Cross-Section Analysis

The intent of the cross-section analysis is to determine with regression analysis to what extent the differences in profit levels between firms, as a measure of performance, can be accounted for by differences in the structural variables common to most studies comparing the performance of various industries using industry averages. The firm was used as a basis for comparison because monopoly or non-competitive performance should be reflected most clearly in the performance characteristics of firms, not industry averages possibly made up of the performance of firms possessing market power and those to which the market power is used against. Thus, the general hypothesis being tested is that the concentration of a firm's primary industry explains a significant portion of the different levels of profits among food processing firms. The level of explained variance is increased significantly by the introduction of other commonly used measures of firm and industry structure and conduct.

A set of variables uncommon to the studies reviewed in Chapter II are introduced to account for differences in the product mixes of

companies (diversification) and market power achieved through diversification (diversified power index).

The cross-section analysis gives one view of the long-run cost and revenue structure since it represents firms of varying sizes operating plants employing different technologies but subject to similar potentialities in technology and price conditions, and subject to similar exogenous forces. Some economists maintain that cross-section analysis presents the best representation of the long-run situation (17, p. 36). However, it is not entirely accurate to assume that a firm on one point of the cost curve could move to another point since these two points represent different firms in reality. Time series indicates how the firm has adapted to changes in technology, price-cost conditions, and the exogenous forces but does not maintain the usual ceteris paribus conditions of long-run analysis, e.g., price invariance, all firms subject to the same levels of technology, and invariant exogenous conditions. Therefore, cross-section analysis is used here to depict the long-run market and firm situations.

Data were collected for 182 publicly held corporations that were either (1) registered with the Securities and Exchange Commission and listed in Moody's Industrial Manual (1966) as food processors or (2) listed in the Fortune Plant and Product Directory (1966) of the 1,000 largest manufacturing corporations as having some operations classified in the food industries. Cooperatives and a few other companies, particularly where data were lacking or financial accounts were not comparable, were eliminated from the study. The remaining firms are used to represent the population of publicly held corporations engaged in food processing.

In a specific breakdown, there are 20 corporations remaining that are primarily classified in meat packing (201), 19 in dairy products (202), 30 in canned and frozen fruits and vegetables (203), 27 in grain milling (204), 19 in baking (205), 25 in other and miscellaneous food products, and 40 primarily in non-food manufacturing.

This group of firms was chosen for the following reasons: First, financial reports are filed annually with the Securities and Exchange Commission by these corporations. Moody's then publishes this data making known the changes in accounting procedures, ownership, or control of the corporations. This provides a ready source of consolidated financial data.

Second, partnership and proprietorships which are subject to different tax laws than corporations and have different accounting systems are eliminated from the study.

Third, these firms account for a sizable segment of output of manufactured food products. In addition, they are the industry leaders and medium sized firms in each industry. Therefore the samples include those firms in the industry that could possess market power and those to whom the power could be used against.

Data on the revenue, costs, and assets were taken from Moody's for the 1965 fiscal year. Three measures of profit rates were calculated to depict performance. These ratios were used as dependent variables in the regression model. The average profit rates for a three year period were calculated for a subsample of the companies to eliminate any erratic annual changes in profitability. The differences between

1965 profit rates and the average three year profits did not justify using the average for the entire sample.

Measurement of profitability

The commonly used net profit to net worth ratio indicates a firm's ability to achieve a return on its invested capital above any cost involved in getting a product to market. Since the effect of taxes may be different on firms in different states and of different sizes a second measure was calculated. This measure is the ratio of net profit before taxes plus depreciation to net worth. Depreciation is subject to much variation which is not accounted for by true capital usage but only accounting and institutional differences. Therefore, this ratio is a gross measure of the return to capital and investment. It is clean of any possible artificial differences caused by varying types of depreciation write-offs used by companies employing similar capital.

The third measure of profitability used is the ratio of gross margin to total revenue. This ratio is calculated as the difference between cost of goods sold and total revenue divided by total revenue. Cost of goods sold includes the cost of those items directly associated with the physical production of the product, i.e., materials and inputs purchased, production labor, and inventory costs. Cost of goods sold most clearly approximates the variable cost of production of any measures available from the data sources. This ratio eliminates depreciation, administrative expenses, advertising and promotion, and interest. These items are eliminated for two reasons. Either the accounting procedure is such that the accounts bear little relation to the underlying economic

concepts or the expenses are particularly susceptible to receiving excess returns, e.g., executive compensation and advertising, as was discussed in an earlier chapter. The remaining ratio is then not identical to but a close approximation for the marginal cost-price comparison suggested by Lerner as a measure of monopoly (47, pp. 157-175).

A comparison of the regression results using these three ratios as dependent variables should point to the existence (or nonexistence) of monopoly power and the influence of accounting procedures on the measurement of monopoly power. The firm could be earning nonexcessive profit rates but they might be the result of margins used to pay excess compensation to officers, excess rewards to capital through rapid depreciation techniques, and excess advertising and promotion that could act not only as an area for excess rewards but also as an area to build up additional barriers to entry.

The independent variables are used as measures of (1) market power derived from the primary operation of the company and from the diversified operations of the company; (2) size of company operation, (3) barriers to entry from certain capital requirements; (4) product differentiation and (5) product diversification. The bases for the hypothesized relationships were presented in Chapter II and thus only the specific hypotheses will be presented here.

Measurement of industry and firm structure

The industry concentration ratio is used as a measure of the monopoly power the firms derive from maintaining their primary activity in a highly concentrated industry (83, Tables 2, 3).

The firm concentration ratio makes no account of the monopoly influence of diversification.[7] Therefore, a second variable was added, $\Sigma\ a_i\ c_i$, where a_i is the share of the firm's employment in the ith nonprimary 4-digit industry and C_i is the concentration ratio of the ith nonprimary activity. This measure forms a weighted concentration ratio for the firm's diversified activities based on the share of the firm accounted for by each nonprimary activity. The separation into two variables allows for the measurement of the influence of (1) primary industry concentration and (2) power gained by the diversification into highly concentrated industries on profit rates, the chosen measure of monopoly performance. Thus, it is hypothesized that there is a significant and positive relationship between profit rates and both primary industry concentration and diversified power.

The weights used in the diversified power index and other diversification variables were calculated from employment data purchased from McGraw-Hill Plant Census, a division of McGraw-Hill, Inc.[8] A list of individual plants belonging to the companies in the population described

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[7]The composite diversified power index is considered with the other structural variables in this section even though it is a direct result of endogenous conduct and was considered as such in Chapter II. The power index is considered as a structural variable here because of its close relationships in methods of calculation to the other structural variables and secondly because the result of the conduct employed in diversification is a structural change in the company (or the company's product mix).

[8]The McGraw-Hill Plant Census includes over 85 percent of manufacturing employees and 88 percent of value added by manufacture.

above were supplied to McGraw-Hill. They in turn classified each plant into one 4-digit industry and indicated the number of production employees at that plant. Coverage of the total employment of any given company was determined to be sufficient for the development of the diversification indices if data were provided for 80-85 percent of the production plants of the company. This requires the assumption that those plants not covered were randomly distributed between the company's primary and nonprimary activities. (Various distributions of these data are presented in Appendix C).

Total employment for each company and its subsidiaries was developed by summing the plant totals. The percent of company output in each 4-digit industry (the weights) was then approximated by the ratio of employees in each 4-digit industry to total employment. Nonmanufacturing activities and services were excluded from both the numerator and the totals used in the denominator.

The diversification data are understated because each plant (whether single or multi-product in nature) was classified into one 4-digit industry. An observation of the relationship between multi-product plants and the primary product of the company revealed that in most cases the multi-product plant is primarily engaged in the production of the product that is also primary to the company.[9] This bias is probably partially adjusted for by the fact that some diversification could not be distinguished from vertical integration and was tabulated in the index as diversification.

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[9]There was no statistical proof available to back this statement, but where checks could be made this statement was supported.

The absolute size of the firm was measured by the total assets of the firm. This variable is used in the regression system to test the hypothesis that firms achieve high levels of profitability from their absolute size. If the firm achieves high profitability because it is large relative to other firms in the industry or is in an industry with a few large sellers there is reason to suspect monopoly power. But if the firm achieves high profitability merely because it is large in absolute size the monopoly implications are not present. If both absolute size of the firm and concentration indexes are significant factors causing high profits further examination of the cost structures of the firms is needed to determine if the size is justified on efficiency grounds.

An additional variable is needed to test the relationship between absolute size and profitability because of the varying product mixes of the companies. An index of the extent of diversification was developed for each company. This index is: $(\frac{\text{non-primary sales}}{\text{total sales}})d$ where d is the number of 4-digit industries in which the company produces products. The multiple is needed to account for the two dimensions of product diversification. One dimension is the extent to which the firm produces non-primary products, i.e., the ratio of non-primary sales to total sales.[10]

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[10]The ratio of non-primary sales to total sales was developed by multiplying the number of employees at each plant by the value of shipments per employee. The value of shipments per employee was taken from the size class and 4-digit industry in which each plant fell in the 1963 Census of Manufacturers. A total was then calculated for each company and its subsidiaries. The 4-digit industry representing the largest output was considered the primary industry and subtracted from the total to arrive at the non-primary sales used in the ratio.

The second dimension of product diversification is the number of distinct products the company produces. This dimension is accounted for by assigning each 4-digit industry[11] in which the firm maintains production a weight of one.

There is no a priori reason for assigning weights of one to the various products produced. This weighting system was chosen over other systems for interpretational reasons. A declining balance system of weighting was studied. With this system if a company was producing five products the primary product would be weighted by one, the secondary product accounting for the next largest amount of output 4/5, etc., for other secondary products. There is little logic behind this system which may weight by 1/5 a product closely related to the primary product of the company in a manner that makes it deserving of more influence or weight. Weighting each product by one gives equal weights to all products regardless of the proximity of the product to the primary product of the company.

A first order multiple was chosen to combine the extent of non-primary output and number of products produced because there was no a priori reason to expect a nonlinear relationship. Thus the linear relationship provided a noncomplex interpretation of the indices.

In summary, it is hypothesized that the diversified power index and the measure of the extent of diversification may account for a

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[11]The breakdown at the 4-digit SIC presents a clear picture of product diversification that is not so obvious at the 5-digit level. The 3-digit SIC overlooks a large amount of diversification because of the extent of many 3-digit industries.

significant amount of profit differences between firms not explained by the concentration of the company's primary industry. The power index takes into account the structure of the non-primary industries. The index of the extent of diversification accounts only for the number of products produced by the firm and the extent of the firm's output in these non-primary activities. No account is made of the structure of the non-primary industries in the latter measure.

Measurement of the cost structures

Aggregative cost curves were developed to determine the role of size and product diversification on the cost structure of the firms. A significant relationship between absolute size and profitability could be caused by monopoly power of the firm or scale efficiencies. Downward sloping average cost curves would indicate the presence of the latter which calls for a different policy approach than if profits are not justified by scale economies or efficiencies from diversification but are derived from monopoly pricing.

The tests here are not incorporated with the intent of determining in-plant scale effects in the production of any particular product but in finding scale effects in the operation and administration of multiplant- multiproduct firms. This raises the need for a nummeraire that accounts for the quantity produced by multiproduct firms. Prices, Pi, will be considered weights of the quantities produced. Thus total revenue represents a measure of output. This procedure is analogous to determining total cost "by weighting optimum input combinations by factor prices (13, pp. 66-67)." Average total cost (ATC) becomes

equal to total cost divided by total revenue (TR). Since in cross-section analysis constant prices can be assumed and differing product mixes are accounted for by the insertion of the diversification index as an independent variable, the cost curves will reach a minimum point at the same level of physical output as would have been achieved using unweighted physical quantities. The minimum point will occur at a different point on the quantity scale since the entire scale is shifted by the prices of the outputs.

Total revenue, being equal to Σ Pi Qi, could reflect monopoly pricing in the Pi's. This would cause price to be a monotonically increasing function of quantity[12] and could increase the extent of any downward tendency in the average cost curve. But total cost, TC, is also a composite Σ Pj Qj, Pj being the input prices. The Pj's may be influenced similarly to the Pi's only in a downward direction because of monopsony buying power. The food processing firms sell mainly to large national chains and purchasing cooperatives for smaller food retailers. The processors in turn purchase their basic input, agricultural commodities, through either futures contracts, farmers, or smaller specialized firms that perform intermediate services on the product. These markets are all considered highly competitive in nature. Thus, if the firm can attain monopoly prices, in the sale of its products to monopolistic or oligopolistic firms it should also be correct to assume that it can achieve monopsony prices in the purchase of inputs from the competitive firms.

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[12]This is possible because product differentiation exists in the products under question and is carried out primarily by the larger companies that sell large quantities.

This argument invalidates the use of the cost curves as indicators of monopoly power. But if the tests using concentration indexes as measures of monopoly power show little or no significance in the relationship between the firm's concentration index and its profitability the cost curves become valid indicators of the cost structure of the firms. In the presence of a significant relationship implicating monopoly power the cost curves can be used to strengthen the argument by hypothesizing a lower cost per dollar sales for the larger monopolistic firms.

Three cost curves are to be tested using total cost to total revenue as a measure of average total costs, administrative and selling costs to total revenue as a measure of the overhead costs common to all multiplant-multiproduct firms, and cost of goods sold to total revenue as a measure of average direct production costs. The independent variables are the size of firm measured by total assets and product mix measured by the diversification index, $(\frac{\text{non-primary sales}}{\text{total sales}})$ d.[13]

Measurement of barriers to entry and promotional conduct

Two measures of barriers to entry were developed in an effort to account for capital requirements in the production of the company's primary product, and capital requirements created by product differentiation. These two measures approximate the capital requirements in two functional areas of the firm but in no way estimate the total

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[13]The results of these tests were presented as Appendix A because of the lack of any consistent relationships found with the accounting data used.

capital requirement of the large multiproduct firms. Secondly, these measures do not take into account the very important area of capital financing.

Firms under different management in different industries have various abilities in obtaining capital. The ability to obtain capital finances may not only be a barrier to entry but may be a very significant barrier to growth of established firms. The ability of firms to grow and expand is closely associated with both the molding of and stability of the structure of industries (51, 65).

In view of these weaknesses, the measures of barriers to entry adapted in this study account for only a small segment of the possible barriers to entry. This must be recognized in evaluating the results.

The data for the minimum optimal size plant in the firm's primary industry were taken from Tech. Study No. 8(57, pp. 97-99). In this publication the estimates made by Saving and Weiss (68, 75) using the survival technique are compiled and then brought up to date using 1963 census data. With the survival technique the minimum efficient size plant is determined by (1) classifying the plants in an industry by size and (2) calculating the share of the industry output coming from each size class over time. If the share of output coming from a given size class declined over time, this size class does not represent efficient sized plants. Proceeding from the smallest size category upward to the larger categories, the first category in which output as a percentage of total industry output does not decline represents the minimum efficient size of plants.

This criterion assumes that inefficient plants to not survive or remain at their current size. They must innovate and grow (or decline) in size to compete with the more efficient plants. This is entirely an ex post examination and yields few predictive results.

The hypothesized relationship is that the minimum efficient size of the plants in the firm's primary industry acts as a protective barrier to entry and increases the profitability of the firm.[14]

Advertising, the second measured barrier to entry, increases the capital requirements of the firm and, similar to minimum efficient sized plants, should have a positive influence on profitability. Since the effects of advertising are cumulative the total advertising and promotional expenditures of the firms over a five year-period were used as the independent variable[15] (63, pp. 162-179). This should be a better measure of the barriers to entry created by advertising than the current expenditures since only a partial amount of the effects of the latter measure are felt in the current year.

A second measure of advertising was used to account for the extent of product differentiation. This measure, the ratio of current advertising to total revenue, is a measure of the extent to which revenue generated through the sale of a product is used to differentiate the product from similar items. This measure is to some extent correlated with the five-year total advertising expenditure discussed above and also measures the

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[14]The size distributions of plants within each 4-digit food industry are given in Appendix B.

[15]Data were taken from an Economic Research Service project currently in publication stage.

additional capital required by a firm if it is to overcome the cumulative effects of advertising. The ratio of advertising to revenue represents the proportion of revenue that firms must expect to budget to advertising and promotion if they wish to differentiate their products and compete with the large advertisers.[16]

The Cross-Section Regression Model

The complete regression model used contains the profit rates as measures of performance; the concentration of the firm's primary industry, the diversified power index, and absolute size of the firm as measures of the firm and industry structure; and the extent of diversification, barriers to entry, and product differentiation as measures of conduct. The model tested is then:

(1) $Y_1 = f(X_1, X_2 \text{ ---} X_7)$ where

Y_1 = net profit/net worth,

X_1 = four-firm concentration ratio,

$X_2 = \Sigma\, a_i\, C_i$ where a_i = share of the firm's output in the ith industry, C_i the concentration ratio for the ith industry,

X_3 = total assets of the firm,

X_4 = minimum optimum size plant,

X_5 = five-year advertising expenditure,

X_6 = advertising/sales,

X_7 = capital/output ratio.

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[16]Bain considered the existence of high selling costs a measure of performance as well as a form of conduct.

The capital output ratio was added to adjust for the different levels of capital intensity of the firms in different industries. (It is the ratio of fixed capital, i.e., plant, equipment, and land, to net sales). If a significant positive relationship exists between these variables and the level of profitability there is evidence of monopoly power existing in firms in the food industries. If these variables account for a statistically significant amount of the variation in company profitability the same conclusion is reached.

The significance of the relationship of these variables to the dependent variable had to be tested with four regressions because certain data items were missing for some companies.

The first regression:

(2) $Y_1 = f(X_1, X_3)$ was run using 134 observations (the entire population of firms used in this study classified primarily in food processing. In the second regression the variables measuring diversification and minimum optimum size plant were added to give:

(3) $Y_1 = f(X_1, X_2, X_3, X_4, X_7)$. These data were available for 104 corporations, a subset of those in regression (1).

The third regression included the advertising variables for which the most data were lacking, but eliminated the diversification measures. This regression:

(4) $Y_1 = f(X_1, X_3, X_4, X_5, X_6, X_7)$ was run with 51 observations.

A fourth regression, corresponding to equation (1) was run using all data for 44 firms. The observations used to test equation (4) and (5) were the only subset of the population that showed any bias. The

advertising data were typically lacking for the small companies. The missing data which led to the selection of the subsets of firms in the tests of equations (1) - (3) were randomly distributed among large and small firms, diversified and non-diversified firms. Therefore, generalization of the regression results to the original population should not be invalid.

The same regressions were run using (1) net profit before taxes plus depreciation to net worth (Y_2) and (2) gross margin to sales (Y_3) as dependent variables to test for the effects of (1) depreciation as an accounting tool and (2) monopoly payments hidden in overhead accounts such as executive compensation.

Cost curves were then estimated to determine the extent to which size of firm is justified by a downward sloping cost curve. The cost curves of the following quadratic form were tested:

$$(5)\quad ATC = b_0 + b_1 x_3 + b_2 x_3^2 + b_3 x_8$$

$$(6)\quad AOC = b_0 + b_1 x_3 + b_2 x_3^2 + b_3 x_8$$

where

ATC = total cost/sales

AOC = overhead costs/sales

x_3 = total assets

$x_8 = \frac{\text{non-primary sales}}{\text{total sales}}$ d

Variable x_8 was added to adjust for the differences in the product mix of the companies. The cost breakdown was calculated for 104 firms.

A comparison of the regressions measuring the extent (if any) to which monopoly performance is caused by high concentration, product

diversification, and conduct to the extent to which size and diversification are justified by scale effects (either real or pecuniary) provides an indication of the existence or nonexistence of a contradiction in current antitrust policy. In the Supreme Court decision on the Brown Shoe Case merger policy was shifted toward "...the protection of viable, small, locally owned businesses, even where economies of scale might be gained...(11, p. 297)" through the formation of large companies. The comparison of these regressions will not indicate the extent of the inconsistency between monopoly size and efficiency but should indicate its existence.

In summary, the cross-section analysis was constructed to indicate the significance of the relationship between measures of monopoly power (concentration or structure and conduct) and monopoly performance (high profitability). The cost curves are indicators of the significance of scale economies. These regressions by-pass any direct analysis of the pricing system. However, monopoly pricing is measured by the degree to which the profit ratios are influenced by the measures of monopolistic power.

Time Series Analysis

Three objectives underlie the time series analysis: (1) to determine the effect of diversification on the level of profitability over time; (2) to determine the effects of diversification on the stability of profits overtime (risk aversion); and (3) to determine the differences in the growth of diversified and nondiversified firms.

A 30 percent sample was chosen randomly from the population used in the cross-section analysis. The ratios of profit to net worth were calculated for the companies for the period 1947-1965 from Moody's Industrials.

Each firm was classified into one of four groups according to its level of diversification. In group one were those firms completely nondiversified over the entire period; in group two were those non-diversified in 1947 but diversified in 1965; in group three were those slightly diversified in 1947 but significantly more so in 1965; and in group four were those being heavily diversified over the entire period. Since there were no empirical data available for years prior to 1965 corresponding to the ratio of (non-primary sales/total sales) used in the cross-section analysis the firms were grouped and ranked ordinally in groups two through four from high to low diversification on the basis of information given in annual reports, Moody's, and various trade publications. These groupings were used throughout this segment of the analysis.

The average profit/net worth was calculated for each group of firms for each year from 1947-65. This resulted in 19 observations for each group. An analysis of variance was then conducted to determine if there was any statistically significant difference in the average profit rates of the various groups of firms.

Trend lines were then calculated for each group using profit/net worth as the dependent variable and time as the independent variable. Analysis of variance was again used to analyze the coefficients of the

trend to determine whether or not the trends in profit rates were significantly different for the different groups of firms over the period.

The variances of the annual profits of each firm were calculated for the 1947-65 period. Bartlett's test was used to determine the effect of diversification on profit stability. If the average variances of the groups are unequal the F ratio must be used to determine which groups have lower variance.

The third objective of the time series analysis is to determine the relationship between growth and profitability. First, the firms in the sample primarily classified in food and kindred products were used in a Chi square contingency test to determine the existence of any overall relationship between profitability and growth. Average annual net profit/net worth for each firm was used as a measure of profitability. Total annual sales data were deflated with the BLS implicit wholesale price deflator for the primary product of the firm. The average annual growth rate of each firm was calculated from these sales data. A 3 x 3 contingency table was used with equal size classes for profitability and growth respectively.

Second, a similar Chi square test was run to determine the relationship between growth and the diversified structure of the firm. The four groupings of diversification were tested against the same growth categories used in the previous test in a 4 x 3 contingency table.

The results of the tests should indicate, as was described above, the effect of diversification on profits, profit stability and growth overtime. These results along with the results of the cross-section analysis are presented in Chapter V.

CHAPTER IV. GENERAL CHARACTERISTICS OF THE FOOD PROCESSING INDUSTRIES

Growth in the Industries

The structural characteristics of the food processing industries and the changes taking place in these characteristics in the 1947-65 period are considered in this chapter. This is accompanied by a number of examples depicting relevant characteristics of certain of the larger food processing firms.

The size of the food processing sector of the economy (SIC 20) is represented by a value added of $19,735 million, 1.5 million employees, and 36,928 establishments (82, Part II). This size is compared to a total value added of $17,656 million in chemicals and allied products (SIC 28), $15,261 million in primary metals (SIC 33), and $22,765 in transportation equipment (SIC 35).

A comparison of these four major sectors of the economy is given in Table 2 for 1947 and 1963. As can be seen, the food sector has increased 157 percent in value added compared to 232 percent for chemicals, 166 percent for metals, and 290 percent for transportation. The only obvious differences in the 1947-63 changes in these sectors are the 24 percent decline in the number of establishments in the food processing sector compared to increases of 20 percent, 21 percent, and 94 percent in the number of establishments in chemicals, primary metals, and transportation equipment respectively, and the similar decline of 12 percent in the number of companies in food processing compared to slight increases in chemicals and primary metals and a sizable increase in transportation.

Table 2. Growth of major sectors of the economy[a]

Sector		1947	1963	% Change
Foods and kindred products:				
Value Added	($000)	$7,687,541	$19,734,544	157
Capital Expenditures	($000)	$ 820,847	$ 1,137,243	38
Employment		1,338,187	1,554,423	16
Establishments		41,665[b]	36,928	-24
Companies		36,122[b]	31,713	-12
Chemicals and allied products:				
Value Added	($000)	$5,317,001	$17,656,138	232
Capital Expenditures	($000)	$ 804,958	$ 1,545,689	92
Employment		626,418	737,414	18
Establishments		10,019[b]	11,996	20
Companies		8,461[b]	8,794	4
Primary metals:				
Value Added	($000)	$5,841,722	$22,765,674	290
Capital Expenditures	($000)	$ 354,974	$ 1,022,004	187
Employment		1,174,498	1,601,158	36
Establishments		3,703[b]	7,196	94
Companies		4,715[b]	6,237	32

[a]Source (80, Part II).

[b]Company data are for 1954, since 1947 totals were not published by census.

This factor, the sizable decline in the number of companies in food processing, has drawn significant attention to the study of competition in this sector of the economy by the regulatory agencies and economists (57, 82, Part II). The first impression must be that there has been an increase in the extent of oligopoly in the industries in this sector. But there has been an increase rather than a decrease in the number of large companies which would imply that the concept of "more firms, more competition" holds. More companies are able to compete with the large companies rather than fewer, as would be the case if there was a strong monopoly under current. In 1947 there were only 31 companies in food processing with assets of $50 million or more. In 1962 there were 68 corporations in the same size category or an increase of more than 100 percent (87).

Over the 1954-63 period the 20 largest companies engaged in food processing increased their share of total value added in food processing from 22.1 percent to 22.8 percent. The 200 largest corporations increased their share of value added by only 5.8 percentage points (from 48.7 to 53.5) (57, Appendix A).

Changes in Concentration

Of the 40 4-digit industries in the food and kindred products sector, 22 are considered comparable for the purpose of calculating concentration ratios for the 1954-63 interval.[17] Table 3 presents

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[17]The Bureau of the Census considered industries sufficiently comparable to show historical data "...if the employment in the plants reclassified into the new SIC from other industries and reclassified out of the old SIC to other industries, accounted for two percent or less of the original total employment in the old SIC industry (83, p. 5)."

a picture of the changes in concentration for various intervals of firms in the industry size distribution of these 22 food processing industries (excluding alcoholic beverages). The percent of value of shipments accounted for by the four largest firms declined in eight industries from 1954 to 1963, remained the same in one case and increased in thirteen cases. The share of value added represented by the eight out of twenty-two industries that declined was 30 percent. However, the average decline

Table 3. Changes in the concentration ratios of 22 four-digit food processing industries, 1954-63[a]

Percentage points change in concentration ratio	4 largest	5-8	9-20	21-50[b]
Decrease	8	6	6	8
No change	1	2	5	7
Increase 1-3	8	11	7	4
Increase 4-5	2	3	3	2
Increase 7-5	3		1	1
Totals	22	22	22	22

[a]Source (83).

[b]Data are available for 1958 and 1963 only. Historical data are not accountable for the remaining 17 industries.

was 5.6 points per industry. The average increase for the 13 industries showing such a move was 3.7 points per industry. The share of value of shipments accounted for by companies ranked 5-8 increased in 14 industries and declined in only 6. The 50 largest companies in these same 4-digit industries (which represent over 60 percent of value added in food processing excluding alcoholic beverages) increased their share

of value of shipments in 10 industries, witnessed no change in 8 industries, and reflected a decline in 4 industries.

These concentration ratios present an inconclusive set of evidence on the changing structure of the food processing industries. Over the nine-year period described, the increases in 4-firm concentration ratios were less than one-half of one percentage point per year. The 50 largest companies witnessed no change or slightly increased their share of output in 18 industries. This is all occurring in a period when the number of companies primarily engaged in food processing declined by more than 12 percent. The changes in concentration ratios indicate that either the firms leaving the industry account for a small share of the market or the firms disappearing through mergers and abandonments are being picked up by existing firms of a variety of sizes. It is not completely a case of the largest growing through merger or purchase of smaller companies at the expense of the company ranked tenth or the fiftieth in the industry. In addition, more firms have entered the larger size categories. Thus, more than an examination of historical concentration trends is needed to determine the competitive aspects of the food processing industries.

Productivity in the industry has increased significantly over the 1947-65 period. Output per man-hour worked in food processing plants increased at an average annual rate of 2.4 percent a year from 1947-1955 (89, pp. 7-9). The same index of productivity increased at an average annual rate of 3.5 percent from 1955-1965. During this same period total output increased 20 percent while man-hours worked decreased

6 percent. The rate of improvement in output per man-hour has been significantly greater in the food manufacturing sector than the rate of 2.7 for the total private nonfarm sector (83, p. 15). Kendrick estimates the increase in total factor productivity for food and kindred products to be from 132.2 to 147.3 over the 1947-53 period (43, p. 468). Estimates for later years are not available. This gives an average annual increase of 3 percent per year compared to 3.7 percent for all manufacturing over the same period. Thus, from one point of reference the food processing sector has performed at least as well as the average for total manufacturing. The regression analysis that follows will provide additional insights into the performance of these industries.

Extent of Product Diversification

A facet of structure that does not appear in the data above is the extent of product diversification of firms producing food products. Twenty-eight of the 200 largest companies manufacturing food products are primarily engaged in nonfood manufacturing (including some service industries) (57, p. 238). The 200 largest food manufacturers had 28,027 establishments in 1963, 3,585 of which were classified in food manufacturing industries (57, p. 239).

The 100 largest[18] food manufacturers held on the average 7.3 leading positions[19] in manufacturing classes. The 100 largest companies

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[18] Ranked by value added by manufacturers in food and kindred products excluding alcholic beverages.

[19] A firm is said to occupy a leading position if it is one of the largest producers ranked by value added of manufacturer in a 5-digit product class.

occupied 78 percent of the leading four positions in the 4-digit food industries. The same companies occupied 70 percent of the leading four positions of the 5-digit food product classes (57, p. 44-45, 50). This represents an increase from 63 to 70 percent from 1954 to 1963, or less than one point per year.

The 200 largest food manufacturers produced products in an average of 3.7 four-digit food industries and 3.1 four-digit nonfood industries in 1963. The largest 20 firms were in an average of 8.9 food industries. This is an increase for the 20 largest companies from 5.4 industries in 1954 and 2.2 industries for the 200 largest in the same year (57, p. 50). This represents a significant increase in the number of products (5 and 7 digits) produced by these companies.

The ownership specialization ratio[20] declined in 6 of the 10 food industry categories between 1954 and 1958 (80, p. 44). The ratio increased for two categories and two were withheld to avoid disclosure. The industry specialization ratio[21] declined in 5 categories, increased in 3, and was withheld in 2 categories between 1954 and 1958.[22] The

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[20]The ownership specialization ratio describes the percent of establishments in a given industry category that belong to companies classified in the same category.

[21]The industry specialization ratio is the percent of establishments belonging to companies classified in a specific category that are also in the same category.

[22]The Enterprise Statistics covering the 1963 Census of Manufacturers has not yet been published. Also the categories of industries have changed for 1954, 1958, and 1963 leaving few of the data comparable.

multi-industry companies[23] classified in food processing had only 38 percent of their establishments classified in the same food industry as the parent company in 1958 (80, pp. 56-57).

Diversification is not a recent phenomenon. Gort found that the 12 food companies in his sample were in 78 four-digit manufacturing activities in 1947 and 81 in 1954. The average ratio of primary 4-digit industry payrolls to total manufacturing payable for these 12 companies was .763 and .783 in 1947 and 1954 respectively (39, p. 61). The same 12 food manufacturing companies added 157 products and services between 1929 and 1954. Forty of the additions were in nonmanufacturing activities. During the same period these 12 companies abandoned the production of 54 products and services, 23 of which were nonmanufacturing activities. Of the 64 product additions made by these 12 companies into manufacturing activities, 44 products were added in industries growing at least as rapidly as the company's primary industry.

Thus, product diversification is a structural change that has been altering the shape of industries for a number of years. A look at the diverse activities of select corporations will give further insight into the types and extent of product diversification.

The structure of Armour and Bordens

Two companies have been chosen for review, namely Armour and Bordens. It is not contended that these firms are the most diversified of the food

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[23]A company is considered multi-industry if it has plants classified in more than one 4-digit industry.

processors, but both firms are old line companies that have been leaders in their respective primary industries since the late 19th century. Since their beginning they have made extensive additions to their product lines through internal expansion and mergers.

Armour & Co.[24] was incorporated in 1863 as a livestock slaughtering firm. Armour's sales in 1966 exceeded $2 billion. In the same year about 36 percent of Armour's assets were in food operations. The remainder of the assets were spread over chemicals and other industrial products, pharmaceuticals, grocery products, agri-chemicals, and heavy equipment. Armour is still one of the four largest firms in the meat packing industry.

In 1922 Armour was engaged in processing meat products and products from packing house by-products, e.g., fertilizers, soaps, leather products, and various other related products. The company also had an interest in General Stockyards Corproation (which it sold in 1931) and operated a system of branch houses. By 1966 Armour produced a number of products in the industries listed in Table 4.

Armour's leading branded products are Armour Star meats, Vertagreen fertilizers for lawns and gardens, Dial soap (the nation's largest selling bath soap), Appian Way pizza mixes, and Bruce floor waxes and cleaners. Cryodry Corporation, a subsidiary of Armour, is a leader in the development and use of microwave heat processing techniques. In 1965, Baldwin-Lima-Hamilton Corporation was merged into Armour. This took Armour into an entirely new area, that of heavy equipment manufacturing and the development of desalination equipment.

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[24]Information from Moody's Industrials and Annual Reports of Armour and Company.

Table 4. Listing of the production activities of Armour & Co.

Primary operations	Other foods	Chemicals and industrial products	Agri-chemical products	Heavy equipment	Pharma-ceuticals	Household grocery products
Slaughtering livestock	Butter	Fatty acids, esters, nitrogen	Mixed fertilizers	Hydraulic turbines and presses	Hormones, engymes and hema-tologicals	Soaps, detergents and shampoos
Processed meats	Cheese	Derivatives	Ammonia and ammonium mixes	Governors and values	Cardio-vasular and nervous systems drugs	Glycerine
Canned meats	Vegetable oils	Coated abrasives	Super phosphates and phosphatic mixes	Ship propellers	Veterinary biological pharma-ceuticals antacids	Industrial and household floor wax
Poultry and eggs	Salad oils	Adhesives, bonded fibres, capliner and other resin coated products	Insecti-cides	Pumps	Anti-perspirants	Household ammonia
	Cottonseed oil	Shoe and specialty leathers	Weed killers	Heat exchangers		
	Margarine	Pressure sensitive tapes	Fungicides	Desalination systems		
	Shortening			Locomotives and parts		
	Pizza mixes			Highway construction machinery		
	Freeze dry foods			Lumbering, mining, building, construction, and road maintenance equipment		
	Pet foods			Electronic measurement equipment		

Armour operates approximately 24 meat packing plants; 27 dairy and poultry processing plants; 3 plants specifically for processing shortening and edible oil products plus similar facilities at other packing plants; 130 food branch houses; over 30 fertilizer processing plants plus phosphate rock deposit reserves; 4 industrial chemical plants; 7 grocery products plants; 4 pharmaceutical laboratories; 6 adhesives, coated products, and abrasives plants; one leather plant; one microwave processing plant; one tape plant; 6 construction, industrial and electronic equipment plants.

The company's growth and expansion into these diverse areas has been divided among internal expansion and mergers.

The Borden Company was incorporated in 1899 as Borden's Condensed Milk Co., to succeed a business originally established in 1857.[25] The present name was adopted in 1919. In 1966 Borden's total sales exceeded $1.5 billion. Slightly over 50 percent of Borden's output is dairy products and mainly fluid milk products.

The company's operations are spread across other food lines, chemicals, pharmaceuticals, paints and finishes, fertilizers, resins and glues, plastics, latex and rubber products, and custom industrial machines. A complete list of their industry operations is given in Table 5.

Among their widely selling branded products are Borden's dairy and food products, Drake's cake products, Eagle Brand cheese and butter, Cornstack canned vegetables, Starlac dry milk, Aunt Jane's pickles, Elmer's glue, Mistik tape, Robert Powers' cosmetics and many others.

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[25]Data from Moody's Industrials and Company annual reports.

Table 5. Listing of the production activities of the Borden Company

Primary industry	Other food products	Chemicals and related products	Fertilizers	Miscellaneous areas
Butter	Canned fruits, vegetables, baby food, and food specialties	Coated fabrics	Superphosphate and other phosphatic fertilizers	Resin and casein glues and adhesives
Cheese	Poultry and livestock feed supplements	Pressure sensitive tapes	Mixed fertilizers	Printing ink
Fluid, dry, condensed and evaporated milk	Bread, cake, crackers, and cookies	Hexamethyleneta-tramine		Hot melts and binders
Ice cream, sour cream and buttermilk	Confectionery products	Industrial organic chemicals		Asphalt felts and coating
	Powdered fruit juice and flavorings	Plastic materials, synthetic resins and nonvulcanizable elastamers		Latex products
	Process tankage	Synthetic rubber		Plastic packaging and shipping containers
	Coffee, chocolate and cocoa products	Vitamin products		Rubber products
	Potato chips	Surface active and finishing agents		Consumer plastic products
		Cosmetics		Gypsum
		Paints, varnishes, lacquers and enamels		Tin cans
				Can making machines
				Custom made industrial machines

The total assets of Borden Company increased from $259.0 million in 1950 to $698.3 in 1965. Over the same period Borden acquired $194.6 million in assets through mergers and acquisitions (57, p. 116). Thus, less than 50 percent of the growth was via external expansion.[26]

These companies are just two examples of the extent of diversification in food processing firms. Numerous large companies classified in nonfood industries are diversifying into food operations. In 1967, a merger was approved by the stockholders of both companies making Wilson & Co., Inc., a large meat packer and producer of athletic goods, a part of Ling-Temco-Vought, Inc., a diversified manufacturer primarily engaged in aerospace and electronics research and manufacturing. Textron, Inc., one of the nation's most conglomerated firms, is included in the poultry processing industry.

The 1966 Fortune Plant and Product Directory lists 98 firms producing food and kindred products among the largest 500 manufacturing firms in the United States. These firms produced an average of 18 different products (5-digit) in 1966 compared with 15 in 1961. Of these 98 companies, 24 were primarily in food processing and 23 in chemicals. All 24 food processing firms also produced chemicals and related products.

Thus, this change in structural pattern could affect both the extent and type of competition among the large companies in industry. Looking back at Tables 4 and 5 it can be seen that Bordens is no longer free of

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[26]This is not an entirely accurate measure of the two means of growth because after a merger the parent company and the purchased company may both expand internally, thus distorting the apparent growth patterns.

competition from Armour as was the case in the past.[27] These two companies now compete not only with other companies but with each other in certain dairy products industries, canning industries, chemical and related industries, fertilizer industries, and numerous other cases shown in the tables. The analysis in the following sections should provide some clues to the effects of this phenomenon on the performance of the firm and its relation to structural aspects of markets.

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[27] In the past, of course, the two companies competed for the consumer's food expenditure to the extent that dairy and meat products are substitutes.

CHAPTER V. RESULTS OF THE REGRESSION ANALYSIS

The Cross-Section Model

The results of the regression analysis are presented in the approximate order as the variables were described in the previous chapter.

The hypotheses being tested are that concentration measures explain a statistically significant amount of the variation in the profit rates of firms in the food processing industries. The addition of variables that account for other features of structure and conduct successively increases the significance of the level of explained variation. The positive relationship between the independent variables and the profit rates of firms (as a measure of performance) is necessary if the case-by-case approach to anti-monopoly public policy questions is valid.

The hypotheses are structured in a manner that makes the tests particularly adaptable to the computerized step-wise regression program. This program indicates the simple correlation coefficients, enters variables into the analysis in the order in which they explain the variation in the dependent variable, provides the regression coefficients as each variable is introduced, the final regression equation, standard errors of the coefficients, t values, partial correlation coefficients, and multiple R^2 values. Thus the variables will be considered in the context of the four equations described in Chapter III and evaluated on the basis of the contribution to explained variance of each added independent variable.

The influence of concentration and size of firm

First it was hypothesized that there is a positive relation between the concentration ratio of a company's primary industry and the company's level of profitability. Concentration is used as a measure of the monopoly power firms derive from their base of operations, i.e., their primary industry. Thus, firms in the more monopolistically structured industries should achieve higher levels of profitability than the firms in competitively structured industries.

This hypothesis was first tested with a simple linear regression between the 4-firm concentration ratio of each firm's primary industry and the firm's ratio of net profit to net worth. The correlation was positive but the simple correlation coefficient of .039 was not significant indicating that there is no reason to believe that there is a positive linear relationship between the concentration of a firm's primary industry and the firm's level of profitability. A plotting of the points did not yield any evidence of the relationship taking any other explainable mathematical forms. All that can be said from this evidence is that either (1) there is effective competition within the food industries with their various levels of concentration not having reached heights that indicate monopolistic performance or (2) concentration and profitability are invalid measures of the existence of monopoly. The former tentative conclusion is chosen at this stage.

The simple correlation, although still not high, yielded an r value of .15 which is significant at the 95 percent level when the companies classified in nonfood manufacturing activities but involved

in certain food processing activities were included. These companies were typically higher profit companies based in more highly concentrated industries than the food companies.

The lack of any significant correlation between the profit rates of firms and their primary industry concentration could be caused by low profit rates for small firms in the commonly referred to competitive fringe of oligopolistic industries.

A variable was added to determine the influence of the size of firm on profitability to account for this possibility. The size of firm was measured by the total assets of each company. Since individual firm observations were used, there are two sources of variance to take into account: the different levels of profitability within industries and the different levels of profitability between industries.

The relationships between size of firm and profitability (measured by either net profit to net worth or net profit before taxes plus depreciation to net worth) within the food processing sector were not significant. This is somewhat consistent with the findings of Stekler (74, p. 30). Although Stekler's distribution of profits/net worth does indicate an increase as the asset size increases, the largest asset category is not the most profitable. The positive relationship is particularly strong until firms reach $500-1,000 thousand asset ranks. The relationship then levels off significantly with an increase of less than 1.5 percentage points change from firms with assets of $5 million

to firms with assets over $100 million.[28] The various measures of profitability used by Stekler never yielded the highest profits for the largest size category of firms. The smallest firms were definitely the lowest profit firms. However, Stekler considered much smaller firms than are being considered in this study, which is another reason for the low correlation found. The firms in the present study were predominantly in the size classes showing little differences in profitability.

An analysis of variance was run to determine the relation of profit variability within industries to profit variability between industries. The analysis was run on five 3-digit industries.[29] Profit/net worth was used as the random variable. The results are presented in Table 6.

Table 6. Analysis of profit variance for five 3-digit food processing industries

Source of variation	Degrees of freedom	Sum of squares	Mean square
Mean	1	1.099	1.099
Among industries	5	.081	.016
Within industries	131	1.192	.009
Total	137	2.372	F = 1.78

[28]The highest level of profitability appeared in the $50-100 million asset group in the years studied by Stekler. The four largest firms in each of the 3-digit industry groups including meat packing (with the exception of one firm), dairy products, canning, preserving, and frozen fruits and vegetables, grain mill products, and two of the largest bakery products firms had assets in excess of $100 million.

[29]The industries were meat products; dairy products; canned, preserved, and frozen fruits and vegetables; grain mill products; bakery products; and other food miscellaneous products excluding alcoholic beverages.

The calculated F value of 1.78 gives no reason to believe that profit differences between industries are significantly different than profit differences within industries.

A further test was run because of the possibility of a nonparametric distribution of profit rates. A weighted concentration ratio was calculated for each 3-digit industry.[30] The 3-digit industries were then ranked according to concentration and average profit rates. There was no significant relation between the two rankings. The average profit rate in the most highly concentrated food industry group was not the highest nor was the average profit rate the lowest in the most unconcentrated industry for the group of corporate firms used in this study.

The analysis of variance presented above was recalculated for 26 4-digit food industries. Again there was no significant difference between the variability of profits within or between the large corporate firms in the industries in the study.[31]

The average level of profit within each of these same 26 4-digit food industries was calculated and ranked from highest to lowest. Similarly, the respective 4-firm concentration ratio for each industry was ranked and Spearman's rank correlation coefficient calculated. The nonparametric test yielded no significance indicating the independence of the two rankings.

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[30]The 4-digit industries concentration ratios within a specific 3-digit industry were weighted by the size of the 4-digit industry and an average was calculated for each 3-digit industry group.

[31]There was no statistical significance at either the 95 or 99 percent level for the F ratio.

It is not surprising that the multiple regression of 4-firm primary industry concentration ratios and asset size of firms on net profit/net worth yielded an R^2 of .0445; i.e., the concentration and size variables explained less than five percent of the variation in company profits.[32]

A multiple regression was run for each 3-digit group of industries in an effort to determine how much profit variability of firms within each group can be explained by the asset size of the firms within each group. Although the coefficients were all positive for the size variable, the highest correlation coefficients for the quadratic forms on the six industry groups was .26, which is not significant at the 90 percent level. The coefficients were not significantly different from zero. Thus, size variability among the large corporate firms within the respective industries explains little of the differences in profitability when measured by net profit/net worth.

These further tests of the relationship between profitability and size of firm strengthen the earlier conclusion that industry concentration has little influence on profitability when measured by profit to net worth. Certainly if monopolistic profits are being made in an industry they are made by the large not the small firms. The elimination of small firms in this study (who would lower the average profitability of each industry) should bias any results of these tests upward. Even with this bias the relationships are not significant. Thus, the conclusion is

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[32]A 20-firm primary industry concentration ratios were substituted for the 4-firm concentration because of its coverage of a wider range of the size distribution of firms within industries. The level of significance of the coefficients and multiple R^2 were not changed significantly.

reached that in the general case the food industry concentration by itself is not high enough to cause substantial excess profits when measured by profits to net worth. This does not preclude the possibility that other factors could not cause excess profitability and monopoly performance in the food firms.

The influence of diversification on monopoly power

The 4-firm concentration of a firm's primary industry accounts for only that power a firm derives from operations in its primary industry. Many of the large firms in this study are highly diversified into a variety of product lines in such a manner that the firm might derive power from these other markets or from the combination of product markets in which it sells. Thus the diversified power index described in Chapter IV, i.e., $\Sigma\ a_i\ c_i$, where a_i is the share of the firm's output in the ith industry and c_i is the 4-firm concentration ratio of the ith industry, was added to the analysis. This index was calculated from data purchased from McGraw-Hill Plant Census for 104 food processing corporations.

The hypothesis being tested here is that firms gain market leverage by being in a number of industries that permits them to have monopoly power in not only their primary industry but in other industries as well. This market power should show up in higher profits which would yield a positive correlation between the diversified power index and profitability measured by the ratio of net profit/net worth.

The simple correlation of the diversified power index with profit to net worth yielded a correlation coefficient of .06, which is obviously insignificant. A quadratic relationship was fitted as was suggested in

Technical Study No. 8 (57, pp. 205-209). The quadratic equation explained less than one percent of the variation in net profit to net worth. However, the coefficients were similar to those reported in the previous study.[33]

A second measure of diversification was calculated that related strictly to the specific firm's market share. This measure is $\Sigma\ a_i\ b_i$, where a_i is the share of the firm's output in the ith industry, b_i is the share of the ith industry accounted for by the firm. This measure showed no relationship to profitability with a simple correlation coefficient of .009. A simple ratio of nonprimary industry sales to total sales yielded a higher yet still nonsignificant result.

It is possible that the diversified power index does not give adequate weight to the influence of the structure of a company's primary industry. Thus, an additional variable was calculated, $\Sigma\ a_j\ c_j$, where $\Sigma\ a_j\ c_j = (\Sigma\ a_i\ c_i) - A_p\ C_p$, A_p being the share of the firm's output in the company's primary industry and C_p is the concentration of that industry. The simple correlation between $\Sigma\ a_j\ c_j$ and the ratio of net profit/net worth was .12, which is still insignificant at the 95 percent level but is higher than the correlation coefficient for any of the other measures of diversification and net profit/net worth.

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[33]The equation reported was $Y_c = .0746 + .4881x - .2360x^2$. Their product break out was at the 5-digit rather than 4-digit. The regression found in this study was $Y = .051 + .235x_2 - .224x_2^2$. The significant difference in the levels of R^2 between the two regressions will be discussed later.

The purpose of this variable was not to reveal information in a simple correlation but to allow primary industry concentration to enter with a weight of one and concentration of industries that account for other manufacturing activities of the firm to be weighted by their respective shares of the firm's total manufacturing employment.

In the multiple regression these variables, i.e., primary industry concentration and weighted concentration of diversified activities explained a very insignificant amount of the different levels of profitability of firms. The addition of a variable to account for the size of firm increased the level of the explained variance only slightly leaving it at a level so low as to place doubt on the reliability of the coefficients as estimators of the true relation between market power achieved through diversification and the profitability of firms.

The tentative conclusions reached at this stage must be that there is no linear or quadratic relationship between the profitability of firms in food processing industries measured by net profits to net worth and the structure of the firm's primary industry, extent of diversification into concentrated industries, and the absolute size of the firm. Thus, the hypothesis is rejected that these structural measures explain either individually or in combination a statistically significant amount of the variation in the profitability of large corporate food processors.

These findings are consistent with the conclusions reached by Fuchs for the total manufacturing sector (36, pp. 278-291). Fuchs concluded that "rates of return on corporate assets are not very closely related to the concentration ratio...." even though he used industry averages for profit rates that eliminates all within industry variation (36, p. 291).

Bain concluded from his 1936-40 data that the regression line shows a downward slope for profit rates as concentration decreases, "...but the correlation is poor and the fit to any such line is obviously so poor that the inference of a rectilinear or other simple relationship of concentration to profits is not warranted (7, p. 313)." The industries examined by Bain exhibited a significantly higher average level of profits when 8-firm concentration was above 70 percent but average profitability increased significantly again for industries with 8-firm concentration ratios less than 30 percent.

Levinson found the correlation between concentration and profitability ranged from 0.071 to 0.755 using cross-sectional comparisons indicating no stable relationship between the two factors between 1947 and 1958 (49).

The evidence of these studies accompanied with the present findings supports the conclusion that there is little relationship between profitability and concentration in the food industries. If the large multiproduct food corporations possess monopoly power it is not evident in performance measured by profit to net worth. There is equally as much variability of profits of firms within a given level of primary industry concentration, size of firm, and levels of diversification as there is between the various levels of these factors. In addition no relationship was found between average profitability and the average level of each of these three factors when groupings were made to eliminate within industry and within group variation.

Additional findings are evident in the relationship between the extent of product diversification and profitability. The extent of

product diversification was measured for each corporation by two ratios; first, $\left(\frac{\text{nonprimary employment}}{\text{total manufacturing employment}}\right)$ which accounts for the share of the company's output outside its primary industry; and second, $\left(\frac{\text{nonprimary employment}}{\text{total manufacturing employment}}\right)$ d, where d is the number of 4-digit manufacturing industries in which the company produces goods. Neither ratio takes into account the structure of an industry into which the firm is diversified nor the extent to which a firm is diversified into any one industry. The ratios account only for the share of company output in nonprimary activities and the number of nonprimary activities in which the firm is engaged.

Table 7 summarizes the simple correlation coefficients between the two measures of diversification, size of firm, and profit/net worth.

Table 7. Simple correlation coefficients for diversification, size, and profitability for 104 food processing companies, 1965

	D_1[a]	D_2[b]	Asset size	Net profit/ net worth
D_1	1	.7452*	.6284*	.0848
D_2		1	.7211*	.0512
Asset size			1	.0913
Net profit/ net worth				1

[a] $D_1 = \frac{\text{nonprimary employment}}{\text{total manufacturing employment}}$

[b] $D_2 = (D_1)$ d where d = number of 4-digit industries in which the company is an active producer.

*Statistically significant at the 99 percent level.

The correlations clearly indicate that the diversified firms are no more profitable than the nondiversified firms. Neither did the level of profitability increase from slightly to highly diversified firms. It cannot be concluded from these data that diversification did not increase profitability for individual firms over time. This possibility will be covered in the time series analysis. A number of firms, particularly the large meat packers, have shown an improvement in profitability since they diversified. Diversification in other firms could have ceased any decline in profits. The correlation coefficients in Table 7 indicate that for a cross-section of large food processing corporations, the diversified firms are no more profitable than the nondiversified firms.

The correlations also indicate that the large firms are more diversified than small firms. This is consistent with the findings of Gort (39, p. 65). More of the effects of diversification will be discussed in the time series analysis.

The influence of barriers to entry

Measures of barriers to entry were next incorporated into the analysis to determine their respective influence on the profitability of firms. The first measure used was the percent of primary industry necessary to have a "minimum efficient sized plant." This measure accounts for the firm's plants in its primary industry only, not the size of plants in diversified activities. It is expected that as the minimum efficient size of plant increases in a particular industry barriers to entry are heightened thus protecting existing companies from increased competition and increasing their rewards or profitability.

The data for this variable were taken from data tabulated by the National Commission on Food Marketing which updates the studies of Stigler, Saving and Weiss (57, pp. 248-253). Using the survival techniques the size category of the minimum efficient size plant was determined in each 4-digit industry. The lower bound of this size category was then divided by the total employment of the industry to determine the share of industry necessary in such a plant.

The correlation between minimum efficient size of plant and the profitability of a company's primary industry indicated no significance at the 90 percent level. The simple correlation of .09 is significant indication that the relationship is not one of simple linearity.

A high correlation was found to exist between the minimum efficient size plant of a company's primary industry and the 4-firm concentration ratio of a company's primary industry. This relationship must be regarded as unusual since the largest share of output in any of the 4-digit food industries accounted for by the minimum efficient size plant was slightly in excess of three percent and most were less than one percent. However, there was a negative (though insignificant) relationship between the minimum efficient size plant in a firm's primary industry and the absolute size of the firm. This is accounted for mainly by the small size of the industries having a large share of output accounted for by the minimum efficient sized plant relative to a number of the large food processing industries and the fact that the firms in this study primarily classified in these industries were not among the largest in the study.

The second barrier to entry considered was the level of product differentiation created by advertising. Three measures of advertising were tested individually to determine the placement of high advertisers, i.e., by size of firm, structure of primary industry, level of diversification, and the relation between advertising and profitability.

The extent of product differentiation and level of selling costs was first measured by the amount of generated revenue devoted to advertising, i.e., the level of advertising per dollar of revenue. Assuming that advertising increases the salability of a firm's product, the ratio of advertising to total revenue is the extent to which revenue must be placed in advertising for the firm to increase sales and counteract the advertising of other firms.

The second measure, the absolute level of annual advertising expenditures, accounts for the absolute level of capital outlay necessary for firms to compete (at least in the form of advertising) with the large national advertisers. Advertising in this sense is strictly a barrier to entry both to new entrants and to small firms desiring to move into the large national markets.

The cumulative buildup of advertising influence on the salability of a product discussed in Chapter II was measured in this study by the aggregative level of advertising expenditures by each firm over the previous 5-year period.

It was hypothesized that larger firms in concentrated industries were the high-level advertisers. First, the large firms because they have the financial resources to promote large scale advertising. Second,

if a firm has monopoly power it must be large relative to its competitors and must have few competitors. A barrier to entry would be erected to protect a monopoly position or to forestall increased competition. This should result in high advertising in highly oligopolistic industries. Thus, there should be a positive relation between the level of advertising and primary industry concentration, size of firm, and diversification. The positive relationship between advertising and diversification is expected because advertising effectiveness, which is at least in part measured by the exposure rate of a particular advertisement, can be increased through product diversification. A company can expose two products at a reduced cost per product because of the heavy discounting policy particularly in network television advertising. Also the diversified company can, with the cost of one mailing, jointly promote through coupon offers, etc., a number of products. Thus, all of these variables should be positively correlated with the level of advertising.

The extent of intercorrelation between the three measures of advertising would not permit their inclusion in multiple regression analysis. The results to be reported are from simple correlation coefficients and multiple regression in which only one advertising variable is included with other structural measures.

The simple correlation coefficients given in Table 8 indicate the existence of a positive linear relationship between the current revenue devoted to advertising and promotion and the level of diversification

that is significant at the 95 percent level.[34] However, the relationship

[34]Advertising data were available for 51 of the 134 food processing firms. These firms were biased upward in size with respect to the entire corporate population considered earlier.

Table 8. Simple correlation coefficients for advertising variables, size of firm, concentration level of diversification and profitability for 51 major food processing firms

	4-firm[a] concentration	Asset size of firm	Advertising/sales	Current advertising budget	Five-year advertising	D_1[b]	Profit/ net worth
4-firm concentration	1	-0.14	0.30	0.05	-0.06	-0.10	-0.02
Asset size of firm		1	0.15	0.68**	0.78**	0.65**	0.19
Advertising/ sales			1	0.70**	0.27*	0.23*	-0.14
Current advertising budget				1	0.63**	0.56**	0.22
Five-year advertising					1	0.48*	0.18
D_1						1	0.16
Profit/ net worth							1

[a]Concentration ratio is for the primary industry of each firm.

[b]D_1 = nonprimary employees/total manufacturing employees.

*Significant at 95 percent level.

**Significant at 99 percent level.

between the absolute level of advertising and concentration and between five-year cumulation of advertising expenditures and concentration were not significant at the 90 percent level. In addition, the relationship between advertising to sales and size of firm although positive was not significant at the 90 percent level. There is a highly significant linear relation (99.5 percent level) between both the absolute level of advertising and size of firm and five-year advertising expenditures and size of firm.

This set of relations does not yield the conclusion that high advertising is used as a barrier to entry in concentrated industries. It should be expected that not only the rate of advertising to sales is positively related to concentration but also if the intent is to erect a barrier to entry the absolute level of advertising should be high. The lack of the latter result is probably accounted for by the relatively smaller size of most of the highly concentrated industries in food processing. In addition the firms in this sample were biased toward the larger firms and as was stated above the very largest firms were not all classified in the highly concentrated industries.[35] In fact, for this sample of 51 firms the relation between size of firm and industry concentration was slightly negative. The larger firms with larger absolute levels of advertising could be achieving an equally high exposure rate for advertisements of their products with a lower proportion of sales revenue being devoted to advertising expenditures because of the volume discounting practices in effect for various forms of advertising.

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[35]Only 14 percent of food industry value added originates in industries falling within Bain's type I oligopolies (57, p. 207).

Advertising appears to be used by those to whom it would benefit as a barrier to entry. The relations indicate that it is more than a barrier to entry. If it were only a barrier to entry it would be protecting a profit position of certain firms from deterioration. The level of advertising to sales shows no significant linear relationship to the level of profit of firms measured by the rate of profit to net worth.[36] In addition it was reported earlier that there was no significant relation between a firm's primary industry concentration and its level of profitability measured by net profit to net worth. This tentatively indicates that advertising is a form of competition used by the large firms to differentiate their products from others and place their brands firmly in the minds of consumers. In this sense advertising acts as a barrier to entry differentiating the firm's product from close substitutes. But it also represents a costly form of competition between existing rivals.

A positive correlation was found between the share of revenue devoted to advertising and the extent of product diversification in the firm. The correlation coefficient explaining the relation between the absolute level of advertising and the extent of product diversification was .56 which is significant at the 95 percent level. Similarly, the coefficient describing acceptability of the hypothesized relationship between five-year advertising expenditures and the extent of product diversification was significant at the 99.5 percent level indicating a strong positive relationship between the variables.

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[36]The simple correlation coefficient was -.142.

Thus, the hypothesis is accepted that there is a positive linear relationship between the level of advertising and the extent of diversification in firms classified in food processing. Additional data were not available to determine the extent to which products of a diversified firm were jointly advertised. It is known from observation of network television advertisements and reports in the advertising trade publications that some firms use the joint promotion schemes extensively. Thus heavy advertisers could diversify to achieve a fuller utilization of their already large advertising expenditures.

The inclusion of the advertising variables had a noticeable effect on the regression model. The regression including primary industry concentration, asset size of firm, minimum efficient size plant, and the ratio of advertising to sales as independent variables explained a statistically significant (at the 95 percent level) share of the variation in company profits measured by the ratio of net profit/net worth. The statistical significance indicates that the relationship found are very probably true relationships, i.e., not chance relationships. But the low level of the percent of variation in profitability explained by these variables (less than 14 percent) indicates that other factors have a more significant effect on profitability. The explained variance with annual expenditures substituted for the ratio of advertising to total revenue was 24 percent of total variation in net profit to net worth. However, an insignificant level of variance was explained when the five-year aggregate was used.

The complete set of data were available for 45 observations. The measures of barriers to entry were added to the structural measures

(primary industry concentration, size of firm, and diversified market power) to determine the total influence of the factors usually associated with industrial structure on the profitability of firms. Less than 20 percent of the variation in the profitability of individual firms engaged in food processing is explained by these measures. The regression coefficients were all of the expected sign but all had high standard deviations and low t values making the level of reliability of the estimates quite low. The one exception was the minimum efficient size plant in a company's primary industry. This coefficient was reliable at the 95 percent level and exhibited a high positive relationship to the level of profitability. The coefficient of 9.3 indicates that a one percentage point increase in the minimum efficient size plant increased profitability by 9 percentage points. However, it must be remembered that a one percentage point increase in the minimum efficient size plant would be at least a 100 percent increase for most of the food processing industries and would involve an increase in the value of shipments of at least $100 thousand per plant. The partial correlation, which measures the correlation between two variables in a multivariate problem under the restriction that the common association with any of the remaining variables is eliminated, between minimum efficient size plant and the company profit rate holding the other factors constant was .31. The addition of this variable explained more of the variation in the level of profits than any other single variable.

This result seems unusual since Bain and others studying barriers to entry found minimum efficient size plants to be lacking in the food processing industries. These other studies involved a larger universe

of industries, e.g., comparisons of barriers to entry in the auto industry to the food industries. In this type of comparison the food industries would have very low barriers. However, comparisons involving only the different industries within food processing present a different universe. The minimum efficient size plant in meat slaughtering employed 1-9 employees. The minimum efficient size plant in meat processing employed 100-250 employees. The minimum efficient size plant in canned specialities employed 250-500 employees. Thus, there are substantial differences in the capital requirements reflected in these employment differences of minimum efficient sized plants within food processing.

The complete regression is summarized in Table 9 with coefficients, t values, and partial correlation coefficients.

Table 9. Coefficients relating profit rates to structure

Variable	Regression coefficient	t value	Partial correlation coefficient
Constant	0.1316		
4-firm concentration	0.1434	0.9232	0.1521
Asset size of firm	0.0000	0.1969	0.0328
Diversified power index	0.2625	0.5955	0.0987
Advertising/sales	0.3042	0.1830	0.0305
Five-year advertising budget	0.0005	0.7068	0.1117
Minimum efficient size plant	9.300	1.9662*	0.3114
Capital/output ratio	-1.2420	-2.9290*	-0.4387

*Significant at the 95 percent level.

The capital output ratio of the company was added as was suggested by Collins and Preston (82, p. 717) to account for differences in the amount of fixed capital required to produce a given amount of revenue, i.e., differences in capital intensities between firms in differing industries. The variable was estimated by the ratio of book value of fixed assets (land, buildings and equipment) to total revenue. This variable provided a highly significant negative coefficient indicating that as the amount of capital facilities required to generate a dollar of revenue increases the level of profitability declines.

This relationship is explained in part by depreciation charges. As the level of fixed capital assets increases the level of depreciation increases which is a charge against total revenue and thus reduces profits. However, the rate of increase in depreciation would have to be an increasing function of the level of fixed capital assets. There is little a priori reason to expect this to be true other than the extent to which this rate of change is a factor of rapid depreciation write-off systems. The remainder of the explanation must rest in other factors such as higher capital costs for certain firms because of imperfect capital markets and the influence of the substitution of capital assets for labor. Implications relating to these latter factors will be discussed as other measures of profitability are substituted for the ratio of net profit/net worth.

In summary the measures of the structure of a firm, the structure of its primary industry, the barriers to entry, and degree of product differentiation explain only a very small portion of the profit differences

that exist between different corporate firms in the food processing industries. These variables could explain less than 20 percent of the variation in food company profits. When the capital output ratio was included to adjust for differences in the levels of capital intensity among the various firms the level of explained variance increased to 30 percent. The reliability of the estimated coefficients was still very low for all variables other than the minimum efficient size of plant and the capital output ratio. It was shown that the relationship between profitability and size of firm within industry was very weak and not explained by linear or quadratic equations. A similar result was found to exist across industry lines in the food processing sector.

The firms in this study are the large industry leaders down to firms of $5-10 million in assets. Since the very small firms are eliminated from the group of firms considered here, the averages are not brought down for the cases where monopoly performance might be present as they would be if industry averages had been used. The firms in this group are the large firms in concentrated and unconcentrated food industries. Thus, monopoly elements in any industry should differentiate the performance of the largest firms in that industry from large firms in more competitive industries. But the structural variables of neither the firm nor the industries into which it is diversified had a significant influence on performance measured by profitability.

The inclusion of the capital output ratio increased the level of explained variation in profitability more significantly than any of the measures of structure or barriers to entry. This variable is more

directly related to the level of technology and the production function of the firm than to any expected conditions of competition.

The conclusion reached is that the measures of structure, barriers to entry, product differentiation, and product diversification had little consistent influence on the level of performance measured by high levels of profitability in the food processing industries except in the extreme cases. The existence of certain structural characteristics can then be considered necessary but not sufficient conditions for the existence of high profit rates among the food processing firms.

The influence of depreciation and tax charges on profit measures

Depreciation, as was explained earlier, is an accounting tool and has doubtful relevance as a measure of capital usage. Since various forms of depreciation apply under the tax laws to different assets and different firms use different accounting procedures with regard to depreciation, a measure of average gross profitability defined as net profit before taxes plus depreciation to net worth was substituted for net profits to net worth as the dependent variable. This variable eliminates any effect accounting depreciation might have on the profitability of firms and assumes no capital cost other than interest payments and repairs and maintenance. It is similar to the cash flow concept which in a sense is a measure of the financial powers or abilities of firms. The variables described above were rerun through the same correlation and regression analysis to determine the differences in profitability that might be reflected because of firms of varying sizes and industries.

The results of the correlation analysis are given in Table 10. The correlation between the three measures of advertising and promotion expenditures and the other variables must have a higher r value than the other relationships to be of equal level of reliability because these data were available for a smaller sample of firms.

The relationships between a firm's primary industry concentration ratio; asset size; diversified power index; level of diversification; minimum efficient size of plant in its primary industry and profitability measured by the ratio of net profits after taxes plus depreciation to net worth (average gross profitability) respectively, are not significantly different than when tested against net profit to net worth. The coefficients remain at a very low level of reliability even though the table indicates small changes in their levels. The relationships between the concentration of a firm's primary industry and average gross profitability is only slightly increased. The relationship between size and profitability declines with this measure as does the correlation between power achieved through diversified activities and average gross profitability. There was an increase in the correlation between the diversified power index and average gross profitability. But to repeat, the changes in these relationships are not adequate to allow the acceptance of the hypothesis that they are linearly related.

The relationships between the measures of selling costs and average gross profitability change significantly. The correlation between advertising to sales and profitability had a negative sign although statistically insignificant when profits were measured by net profit to net worth. This relationship becomes positive and significant at the 95

Table 10. Simple correlation coefficients comparing structural variables to profit/net worth and profit after taxes plus depreciation/net worth

	4-firm concentration	Asset size of firm	Diversified power index	Weighted concentration of non-primary activities	Non-primary sales/total sales	Advertising/sales	Current advertising budget	Five-year advertising	Minimum optimal size plant	Profit/net worth	Average gross profitability
	1	2	3	4	5	6[a]	7[a]	8[a]	9	10	11
1	1	0.082	0.740	0.096	0.027	0.298	0.049	0.056	0.457	0.066	0.109
2		1	0.126	0.616	0.628	0.148	0.683	0.779	0.135	0.091	0.051
3			1	0.071	0.015	0.308	0.408	0.370	0.346	0.062	0.145
4				1	0.823	0.430	0.761	0.433	0.034	0.124	0.008
5					1	0.229	0.558	0.485	0.024	0.084	0.074
6[a]						1	0.698	0.270	0.172	0.142	0.315
7[a]							1	0.633	0.172	0.217	0.069
8[a]								1	0.159	0.177	0.012
9									1	0.102	0.025
10										1	0.401
11											1

[a]Because of differing degress of freedom the correlation coefficients for variables 4, 5, and 6 require an r value of .23 to be significant at the 95 percent level whereas the other variables require an r value of .16 to be significant at the 95 percent level.

percent level when profits are measured by the average gross profitability ratio. The only apparent answer for this relationship is that the companies with high percentages of revenue devoted to selling and promoting products must use liquidity derived from large depreciation reserves to advertise. This relationship is not as strong for the largest volume advertisers. The firms for which it holds are identified as those that devote the largest share of revenue generated from sales to promoting their products.

The simple correlations yield little suggestion that depreciation charges are used by large firms in such a manner as to hide monopoly returns. Depreciation, by the nature of accounting, can provide firms with additional liquidity which may be used for advertising by certain firms, growth and expansion by others, and research and product development by still others. But the results of the tests conducted yield no immediate implications concerning any monopoly power held by large firms with large levels of depreciation costs other than via its use in financing advertising.

The multiple regression analysis with net profit after taxes plus depreciation to net worth also yielded results very similar to the results described earlier with net profit to net worth being the dependent variable. The first multiple regression run with 134 observations with the concentration ratio of a firm's primary industry, the asset size of the firm, the minimum efficient size plant in the firm's primary industry, and the firm's capital output ratio yielded the following regression coefficients and t values and explained less than two percent of the variation in average gross profitability.

$$Y = .2209 + .079\ X_1 - .0000X_2 + .057X_3 + .088X_4$$

$$(1.04) \quad (-.620) \quad (.034) \quad (.729)$$

where X_1 = 4-firm concentration ratio

X_2 = asset size of firm

X_3 = minimum efficient size plant

X_4 = capital/output.

Obviously, the level of explained variation is too low to allow any reliability to be placed in the estimated function. The addition of the diversified power index, i.e., $(\Sigma\ a_i\ C_i) - (a_p\ C_p)$ had an insignificant effect on the explained variance (which was still below two percent).

The complete regression model run on the 44 observations described above included the 4-firm concentration of a firm's primary industry, the firm's asset size, diversified power index, minimum efficient size plant, advertising to sales ratio, and five-year advertising expenditure. The linear equation explained 12 percent of the variation in profitability compared to 19 percent when net profit/net worth was used as the dependent variable. The addition of the capital output ratio increased the explained variance to 34 percent of total variance which is significant at the 95 percent level of reliability.

The complete regression with corresponding standard errors was found to be:

$$Y = .141 - 0.115X_1 - 0.0000X_2 - 3.025X_3 + .916X_4$$

$$(0.1200) \quad (0.0000) \quad (3.653) \quad (.3275)$$

$$R^2 = .34$$

$$+ 1.018X_5 + 0.0004X_6 - 0.1353X_7$$

$$(1.128) \quad (0.00063) \quad (0.3404)$$

where X_1 = 4-firm concentration

X_2 = asset size

X_3 = minimum efficient size plant

X_4 = capital/output

X_5 = advertising/sales

X_6 = five-year advertising

X_7 = diversified power index

The standard errors of the estimates of all coefficients are large relative to the size of the coefficient with the exception of the capital output ratio. The sign on the capital output coefficient becomes positive and significantly different from zero. This is as would be expected since firms with highly capital intensive production techniques would have higher depreciation allocations. It must be noted with this regression as with the previous regression (with net profit/net worth as dependent variables) that this one variable which is more closely related to the production technology of a given firm than to the structure of the markets in which it produces explains more of the variability in profits (measured by either technique) than all of the structural measures combined.

It should be noted also that the signs on the measures of market power derived from the structure of a firm's primary industry and from its diversified activities become negative, i.e., there is a negative relationship between a firm's primary industry concentration, diversified

market power, absolute size and average gross profitability. This again supports the conclusion that the largest firms and those in the most concentrated industries are neither the most profitable nor gain the most liquidity from depreciation reserves.[37]

The influence of structural variables on average gross margin

The relationship between the average gross margin of a company and the structural features of the company and industries in which it operates was tested with correlation and regression analysis in a manner identical to that used with the other measures of profitability. Firms with more market power than others can charge a price that insures it a higher margin over production costs. This per unit margin, as was described above, can be used for increased advertising, research and development, excess executive compensation, etc., which may benefit or hinder competition. Average gross margin was calculated for each firm by subtracting from total revenue the cost of goods sold and dividing by total revenue. It was expected that the measures of structure would have a positive relation to average gross margin for as the levels of the structured measures increase the extent of monopoly power shown in higher gross margins is increased.

Table 11 presents the simple correlation coefficients including average gross margin. As in the previous table, the variables represent 104 observations with the exception of advertising/sales, total current

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[37]The change in the sign from a positive level using the larger sample to the negative level using the smaller sample is due to the bias discussed earlier in the smaller sample.

Table 11. Simple correlation coefficients of structural measures with average gross margin

	Primary industry concentration	Asset size of firm	$\bar{z}a_i C_i$	$\bar{z}a_i C_i - ap C_p$	Non-primary sales / total sales	Non-primary sales d / total sales	Advertising sales	Current advertising	Five-year advertising	Minimum efficient size plant	Net profit / net worth	Average gross margin
	1	2	3	4	5	6	7[a]	8[a]	9[a]	10	11	12
1	1	-0.082	0.740	0.096	0.027	-0.063	0.290	0.049	-0.056	0.457	0.066	0.149
2		1	0.126	0.616	0.628	0.721	0.148	0.683	0.779	-0.135	0.091	0.260
3			1	0.071	0.015	0.048	0.308	0.408	0.370	0.346	0.062	0.081
4				1	0.823	0.643	0.430	0.761	0.433	-0.034	0.124	0.274
5					1	0.745	0.229	0.558	0.485	-0.064	0.084	0.263
6						1	0.128	0.528	0.545	-0.090	0.051	0.123
7[a]							1	0.698	0.270	-0.172	-0.142	0.442
8[a]								1	0.633	-0.172	-0.217	0.328
9[a]									1	-0.159	0.177	0.289
10										1	0.102	0.047
11											1	0.153
12												1

[a]Because of differing degrees of freedom the correlation coefficients for advertising/sales, current advertising, and five-year advertising require an r value of .23 to be significant at the 95 percent level whereas the other variables require an r value of .16 to have the same level of significance.

advertising, and five-year advertising expenditures, which represent 50 observations. The latter three variables require a higher simple correlation to be significant at the 95 percent level because of the smaller number of degrees of freedom.

Table 11 indicates that the strength of the correlations between the structural variables and average gross margin increases over the correlation between the same structural variables and net profit to net worth. The linear relationship between concentration in a firm's primary industry and average gross margin explains more of the variability in the latter variable than a linear relation between the former variable and net profit to net worth. The relationship is still very weak, i.e., the two variables do not tend to move simultaneously. The relationship between size of firm and average gross margin is significant at the 99 percent level. A similar level of significance was displayed in the relationships between market power derived from nonprimary activities, i.e., $\Sigma\ a_i\ C_i - (a_p\ C_p)$ and average gross margin; the level of diversification, i.e., nonprimary sales/total manufacturing sales and average gross margins; advertising/sales and average gross margins; and current advertising and average gross margins. Insignificant relations were found between average gross margins and (1) diversified power index, i.e., $\Sigma\ a_i\ C_i$ the measure used in the NCFM study, (2) the composite measure of the level of diversification, i.e., $(\frac{\text{nonprimary sales}}{\text{total sales}})\ d$, where d is the number of 4-digit industries in which the firm operates, and (3) the minimum efficient size plant. The remaining correlations were positive and significant at the 95 percent level.

These relationships can be put together to show economic as well as statistical significance. First, the largest firms (not necessarily those in the most concentrated industries) have the highest average gross margins. These firms gain significant market power from their nonprimary activities. They are also the largest volume advertisers which is highly correlated with average gross margins. This raises two possible explanations for the high margins held by the large companies. First, the higher margins could be the result of real or pecuniary economics in the production of the goods. If this were true there should be a negative relation between direct production costs, i.e., cost of goods sold, and size of firm. The simple correlation between cost of goods sold and size of firm is -0.05, which causes one to reject the hypothesis that there is a linear relationship between the two variables. The regression coefficient was zero to five decimal places with a large standard error. Thus, the hypothesis that the coefficient was less than zero was rejected.

The second possible explanation is that the larger firms achieve a higher margin by selling their products at higher prices. Since production costs were shown to be no lower for the large firms the higher margin must be due to higher prices being charged. This raises the question, how can firms selling the same product in the same markets charge different prices? The large firms with the high margins also had high advertising costs. "Coupon offers" and "price-off" offers are both advertising and price competition. Other forms of advertising differentiate the advertised product from the nonadvertised product in the minds of consumers. Thus, with a differentiated product the firm can charge a higher price. The large advertising expenditures increase the level of

overhead costs which in turn brings the rate of net profitability down to the level of smaller companies.

Secondly, the large firms in food processing are virtually the only firms that have large research and development budgets. Markham and McFarland point out that firms in the largest size class of food processing firms (5,000 or more employees) account for less than one third of the total food processing sales but approximately 80 percent of R & D expenditures made by food processing firms (52, pp. 91-101). The largest firms spent 3/10 of one percent of each sales dollar on R & D compared to 2/10 for the middle size group (1,000-4,999 employees), and 3/100 of one percent for the smallest size group of firms. Thus, the largest food firms spent ten times as much on R & D as the smallest firms in terms of expenditures as a percent of sales. Markham and McFarland went on to indicate that 75 food processors listed in Fortune's 500 Largest Corporations accounted for "as much as 90 percent of the total" R & D expenditures of food firms(52, p. 98).

A correlation between R & D expenditures and degree of conglomerates measured for these 75 firms by the number of 4-digit industries in which they operated indicated the existence of a significant positive relation between the variables. Thus, as the degree of conglomerateness(called diversification here) increased the level of R & D expenditures as a percent of sales increased significantly.

These results accompanied by the current findings indicate that the higher prices charged by the large firms are not only the result of advertising and promotion but also quality and innovative competition that is the result of research and development programs.

The multiple regression analysis, as would be expected because of the higher simple correlation between the structural variables and average gross margins than between the structural variables and net profitability, explained a significant share of the variation in average gross margins with different combinations of independent variables.

The regression between the 4-firm concentration of a firm's primary industry, X_1, the asset size of the firm, X_2, and average gross margin Y, was run for 134 companies classified in food processing. The following results were obtained.

$$Y = 0.092 + 0.144\ X_1 + 0.0000\ X_2$$
$$\qquad\qquad (0.066) \qquad (0.0000)$$

The coefficients were both greater than zero at the 95 percent level of significance.[38] The level of explained variance was significant at the 95 percent level but was less than 10 percent. Thus, the fit must be considered weak.

The addition of the capital output ratio as an independent variable increased the level of explained variation to 17 percent.

The addition of the diversification variables had little effect on the level of explained variation. The linear regression still explains less than 10 percent of the variation in average gross margins. The sign on the coefficient for diversified power achieved through nonprimary

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[38]The t value for X_2 was 2.49. The computer program dropped all digits after five decimal places. Since the observations for this variable were in millions of dollars a coefficient as small as .000001 indicates an increase of $1 million in assets and increases the level of average gross margin by one unit.

activities was positive and the coefficient was significantly greater than zero at the 95 percent level of reliability. However, as can be seen in the regression below the coefficients for size and concentration decline to the point at which they cannot be considered different from zero.

$$Y = 0.10 + 0.073\ X_1 + 0.000\ X_2 + 0.3424\ X_4,$$
$$\qquad\qquad (0.077) \qquad (0.00) \qquad (0.197)$$

where $X_4 = \Sigma\ a_i\ C_i - (a_p\ C_p)$.

The complete regression model given in Table 12 includes advertising and selling costs, minimum efficient size plant, and the capital output ratio in addition to the variables discussed above. This regression explains 35 percent of the variation in average gross margins.

Table 12. Table of regression coefficients

	Coefficient	Standard error	Partial correlation coefficient
Constant	0.128		
Concentration	-0.032	0.096	-0.056
Size	-0.000	0.0000	-0.245
Advertising/sales	0.646	1.027	0.104
Five-year advertising	0.001	0.00	0.306
Minimum efficient plant	-5.076	2.925	-0.278
Capital output	0.576	0.262	0.344
$\Sigma\ a_i\ C_i - (a_p\ C_p)$	0.190	0.273	0.11

The negative signs on concentration and size are explained by the sample of firms. This regression was run on the sample of 44 firms that was biased upward by including mostly large firms. These results

indicated that it is not the largest firms that have even the high margins. It is the next size group of firms. The partial correlation coefficients indicate the influence of size, advertising, minimum efficient size plant and diversification on margins. But the most significant variable is again the capital output ratio which relates more directly to the production technology of an industry than to its existing structure.

Conclusions of cross-section analysis

A number of conclusions can be drawn from the cross-section analysis described above that relate to the competitive aspects of the food processing industries. First, it was hypothesized that high company profitability is a result of market power that a company derives from the structure of its primary industry, the company's absolute size, and its diversified activities which are chosen in such a way to increase, jointly with the market power derived from the company's primary operations, the total market power and pricing influence of the firm. It was found that size, primary industry concentration, and the diversified power index explained very little of the differences in profitability (net profit/ net worth) of the firms in food processing. The firms in this study were the large publicly held corporations listed by the Securities and Exchange Commission. Therefore, the group excluded the very small firms and the privately owned partnership and proprietorships. This sample was chosen because if firms have monopoly power, they must be the large firms in an industry, not the small firms. If firms exhibit monopoly performance derived from the structure of their primary industry there

should be consistent and positive relationships between the structural variables described above and company profitability. The result and performance from monopolistic power should accrue to a firm that has such power, not necessarily to the performance of entire industries where the small powerless firms are averaged in the same series with the large monopolistic firms. The largest companies in an industry did not tend to be the most profitable as would be expected in the presence of monopoly power.[39] Thus, there seems to be little evidence of market power manifest in the form of high levels of profitability in food firms.

Second, neither the power derived from nor the level of diversification had an upward influence on profitability. However, it cannot be determined from the cross-section analysis whether or not diversification ceased a downward movement in profitability. It can be said that the diversified firms exhibited little differences in levels of profitability from non-diversified firms.

Third, the large firms are also the largest advertisers but spend less per dollar of sales than medium sized firms. Both advertising and minimum efficient size plant displayed a positive relation to profitability even though the former was very weak.

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[39]This finding is not limited to the food processing industries. Blair found that in a large number of industries, both food and nonfood, the largest firms are not consistently the most profitable. Similarly he found an absence of any relationship between profitability and size, as reflected by rank within industry. He found that for the 290 manufacturing corporations listed by SEC only 13 percent of the companies ranked number one in their industry by asset size made over 15 percent return on net worth compared to 21 percent ranked 6, 7, and 8 resprectively (82, pp. 1551-1555).

When average gross margin was used as the dependent variable to measure performance the structural variables increased in their levels of significance and ability to explain the variation in the dependent variable. Concentration, size, advertising and diversified market power were more highly related to average gross margins than net profitability. The higher margins seemed to be the result of higher prices, not lower costs. The higher margins do not result in higher profit rates. Thus, there appears to be a changing pattern of competition between the smaller firms and those in less concentrated industries and the large firms in concentrated industries. The former compete and survive by using price competition. The latter use product differentiation, quality, packaging and promotion as competitive tools.

Relation of Results to Earlier Studies

The results of my study display both consistencies and inconsistencies with earlier studies described in the review of literature. This is not surprising since the results of studies relating structure to performance have been quite varied. Bain, as was quoted earlier, found little relationship between concentration and industry profits. Similarly, the simple correlation of profit rates to concentration was relatively low in the Fuchs study.

Other studies using both more aggregative measures of industry concentration and more narrowly defined concepts of industry concentration have found higher relations between profitability and concentration. The Weiss study used industry averages at the 3-digit level of classification (92). The NCFM study incorporated concentration ratios for

individual firms but used averaging and weighting processes to present their final results in such a way that little could be said about the individual firm (58, pp. 202-210). Their results apply only to group averages and not to individual firms and thus do not fit the hypothesis of this study.

Similar results precede this study in relating the size distribution of firms to profitability. When the very small firms in food processing are included, there is a definite upward trend in the relation of profit rates to size of firm (74, p. 107). This is not true when the sample includes only large and medium size firms. The largest firms in the food processing sector were not the most profitable (74, pp. 26, 30, 32). Blair found that only 13 percent of the companies ranked number one in their industry had profits of 15 percent or more (82, pp. 1551-1555). A smaller percent had profits of less than five percent of net worth. Thus, the largest companies are not primarily the highest profit companies but they sustain fewer low profit periods or losses than the smaller companies. This is consistent with the findings of my study and supports the low correlations found between profitability and size of firm.

Little research has been done prior to this study to quantify the influence of diversification on company and market performance or more specifically on the relationship between company diversification and profitability. Gort presented one of the earlier studies on diversification (39, pp. 65-78). He found, as was shown in the present study, that diversification and size of firm are highly positively correlated. There was no consistent relationship between diversification and growth.

Finally, for 111 manufacturing companies he found that profit rates were not correlated to diversification, nor was the change in diversification correlated with the change in profitability. The results of Gort's study for all manufacturing are consistent with the findings of the present study for food manufacturing corporations.

The study conducted for the NCFM bears a more direct relationship to the hypothesis being tested in the present study. The NCFM study tested the relationship of diversified structure of a firm to profitability of a firm by using what I have called the diversified power index.

A few comments should be made concerning the misuse of data in the NCFM study. This should bring to light the reasons for using certain data and measurement techniques incorporated in the present study. The study begins by comparing various segments of the economy (57, pp. 1-3). Food manufacturing is not an industry as is stated in the caption to the figure presented in the study but a sector of the economy. There are numerous industries and markets in the food manufacturing sector whether industries be defined by substitutability of products or similarity of production processes. Food manufacturing is defined by the SIC as a major 2-digit economic sector. On the other hand, motor vehicles and parts is an industry defined by the SIC as a 4-digit industry. It belongs to the sector of our economy that encompasses all transportation equipment. Petroleum refining represents a group of petroleum industries but again does not encompass a number of related petroleum products such as paving and roofing materials, lubricating oils, and others. It is not surprising that food manufacturing is much larger than the other economic segments used in the NCFM study since an economic sector

is being compared to specific industries or partial industry groupings.

The second general point to be made about the use or misuse of data in the NCFM study appears in the section entitled Postwar Industry Growth (57, pp. 5-16). This section is broken into six parts, each consisting of a description of a 3-digit group of food manufacturing industries. The major misuse of data is in the comparison of the assets of the five leading companies in each industry group with total industry assets. The asset figures for individual companies were taken from Moody's Industrial Manuals which are quite consistent in reporting totally consolidated financial data (including balance sheet data) for all companies reported. If the consolidations of subsidiary organizations are only partial consolidations, they are noted in Moody's. The consistency of data from one corporation to another is known and makes intercompany comparisons valid where adjustments are made for the degree of consolidation.

The more difficult data to obtain are those for industry totals. The NCFM study used the 3-digit industry asset totals published by the U. S. Internal Revenue Service in The Source Book of Statistics of Income. The basis of a corporation under the filing system required by the Internal Revenue Service (IRS) is a legal one and has little relation to the economic concept of a corporation or the definition of a corporation used by the Bureau of the Census, i.e., all resources owned by or controlled by a common decision making unit (at the highest level of decision making).

A corporation may file returns to the IRS in three forms: (1) completely consolidated; (2) completely unconsolidated; and (3) partially

consolidated. There is evidence that few corporations file completely consolidated returns. The Link study (80, Part III) shows rather conclusive evidence of this fact. In 1958, Census was able to match only 1.6 percent of all corporations filing tax returns to Census defined corporations. These were not all complete matches since Census accepted partial matches when it was felt that a representative part of a Census defined corporation was identified in IRS records. If corporations had filed completely consolidated returns, there would have been near 100 percent match.

The 5-company totals used in the NCFM study represent highly consolidated financial data. The industry totals represent only shades of consolidation. Thus, the relation (nearness) of the 5-company total to the industry total must be greatly exaggerated. A similar situation exists for the concentration ratios presented in other data given in the report (57, pp. 222-224).

In searching for data to test the major hypothesis of this study, the most serious void was the lack of well-defined industry financial data. Some of the problems of IRS data were indicated above. In addition to the consolidation problem, the IRS system of classification is not identical to that of the Census Bureau so one cannot rely on having the same grouping of firms in both sources. In sumamry, if one is interested in a consolidated total for some data item on corporations primarily classified in a particular industry, the Census Enterprise Statistics are virtually the only source. This source contains little if any financial data other than value added and value of shipments.

If nonconsolidated data are desired to give a relatively clean picture of a particular product line, IRS data may be a proxy but again these data are not directly comparable to Census size distributions and can yield spurious relations if the two data series are compared. This explains the careful use of the descriptions of relations between factors in a firm's primary industry and the firm in this study and also led to the use of Moody's consolidated data and the diversification variables to adjust for differing product mixes of firms classified in the same primary industry.

The last general point to be made concerning the NCFM study pertains not to the misuse of data but to the presentation of a number of data tables, the source of which is identified as a special tabulation by the Bureau of the Census, without describing why the tables were presented nor discussing in any way the implications of the data presented. The data being referred to are those concerning the "leading positions" held by the 100 largest food manufacturers. As an example, there were 116 food product classes in 1963. The 100 largest food manufacturers occupied one or more of the eight leading positions in 114 of these 116 product classes (57, p. 46). On first glance this seems to be a very relevant description of control but a little investigation indicates it to be almost a tautology. The 100 largest firms, being distributed over 116 product classes, merely by being the largest firms should occupy most of the leading positions. The NCFM study goes on to show that the leading firms occupy an even larger percent of the leading positions in concentrated product classes than in unconcentrated product classes.

This is even nearer to being a tautology than the former statement. The industries (although they do show some variability in size) would not be concentrated if they did not have large firms in them. Thus, it would be interesting to know more about the purpose of this vast gathering of data or at least the intent in mind, but there appears to be no hypothesis related to these data, at least in the NCFM report.

The specific purpose at hand is to compare the results of the correlations between the diversified power index and profitability for the food processing firms in the NCFM study to similar correlations in the present study. The diversified power index was calculated for 85 firms in the NCFM report using 1950 data. The diversification data were taken from a 1950 survey of the 1,000 largest manufacturing companies conducted by the Federal Trade Commission. Concentration ratios were taken from 1950 to 1958 data. This gave the data being used at least an eight-year spread (although the intent is to examine a cross-section of the firms). The diversified power index was calculated by multiplying the 4-firm concentration ratio for each 5-digit product manufactured by the firm by the value of shipments of each product respectively, summing these products, and dividing by the firm's total value of shipments.

These indices of market power were then correlated to the average profit rates of each firm over a three-year period (1949-51). Results were not presented in the NCFM report for the regressions using ungrouped data. The data and results that were presented were subject to the following grouping procedure: first, whenever one or more firms had identical diversified power indices, the firms were combined and a

weighted average profit rate was calculated using total value of shipments of each firm as weights; and second, concentration size classes were combined to yield a group size of at least $200 million in value of shipments for each observation.

This correlation without the grouping procedure differs from the correlation and regression analysis of the present study only slightly.

First, the diversification data in the NCFM study cover the year 1950 whereas the data in the present study cover the 1965 period. Most firms in food processing were considerably more diversified in 1965 than in 1950. Thus, if this factor is to effect concentrated power derived from diversification, the power index covering 1965 should be consistently higher than the same for 1950. The second difference does not allow a valid comparison of the raw data of the two studies.

The NCFM study incorporated 4-firm concentration ratios for 5-digit industries. Product data for the present study were not specifically detailed to allow breakdowns narrower than the 4-digit industry level. The 4-digit industry gives a clearer picture of product diversification and conglomerateness than the 5-digit breakdown developed by the SIC. The 5-digit breakdown places in separate product classes many items that are highly substitutable and horizontally related in the food product lines. Those products would fall in the same market.

The narrower product classification will give a higher index to the NCFM study than the 4-digit classification used in the present study. The degree of difference may be enough to cancel the effects of an increase in diversification over the 15-year period.

The grouping procedure of the NCFM study resulted in 20 observations of the diversified power index and weighted profit rates. These grouped observations are reproduced in Table 13 (57, p. 206). A quadratic function used to determine the relationship between weighted profit rates and diversified power yielded the following equation:

$$(1) \quad Y = .0746 + .4881\ X - .2360\ X^2,$$

with $R^2 = .829$, where Y = weighted profit rates and X = diversified power index. This fit seemed extremely good. The nonlinear form indicates that 83 percent of the variation in average profits of the grouped observations was explained by the averages of the grouped diversified power indices. The standard errors of the estimates were not given so the reliability of regression coefficients could not be determined.

A direct interpretation of this regression indicates that less than 20 percent of the variation in profitability remained to be explained by other factors, e.g., strikes, down swings in certain markets or cyclical behavior, internal efficiency, and differing cost of financing operations, as well as factors such as high promotion costs and barriers to entry. These factors are not all incorporated in the diversified power index. Thus, further examination of the index seemed desirable.

An identical nonlinear regression was run with the 1965 data of the present study. The observations were not grouped in any way. The following regression resulted:

$$(2) \quad Y = .0512 + .2351\ X - .2248\ X^2$$

$$\qquad\qquad\qquad\qquad\quad (.376) \qquad (.444)$$

with an R^2 of .006. The standard errors of the estimates are in parentheses.

Table 13. Weighted concentration ratio and profit rates for 20 groups of food manufacturers, 1950[b]

Group number	Number of firms	Average size of firms	Total value of shipments	Weighted concentration ratio	Weighted profit rate[a]	Weighted profit rate for groups
		Millions	Millions			
1	5	$ 43.0	$ 215	31	7.7	
2	4	191.5	766	35	7.8	
3	6	272.5	1,635	36	6.7	
4	3	1,497.0	4,419	37	5.5	
5	3	105.0	315	39	9.3	
Average				30-39		6.2
6	6	57.3	344	44	7.2	
7	13	100.8	1,310	46	9.5	
8	5	39.8	199	47	7.6	
9	5	117.2	586	48	10.1	
10	3	72.3	217	49	9.3	
Average				40-49		9.2
11	4	187.3	749	50	14.0	
12	3	179.0	537	51	12.4	
13	3	230.3	691	52	12.3	
14	3	258.3	775	54	12.2	
15	2	195.5	391	59	14.2	
Average				50-59		12.9
16	3	193.0	579	64	14.6	
17	3	123.7	371	68	14.5	
Average				60-70		14.6
18	3	50.3	151	71	16.0	
19	2	161.5	323	80	15.3	
20	6	59.2	355	88	17.4	
Average				70-90		16.3
Total	85		$14,928			

[a]Net profit after taxes as percent of net worth.

[b]Source: (57, p. 206)

The difference in the levels of coefficients is not extremely great since the data differ in time by 15 years and involve different levels of concentration. However, the reliability of the estimates in the present regression is very low as is shown by the low R^2 and high standard errors of estimate relative to the size of the coefficients.

The explained variance was higher (although still extremely low) when $\Sigma\ a_i\ b_i$ was used as a measure of diversified power, where a_i is the share of company output in each 4-digit industry and b_i is the share of that industry accounted for by the firm. Standard errors were lower and values more respectable although still not extremely significant. The regression yielded the following results:

$$(3)\quad Y = .086 \quad .245\ X - .103\ X^2$$
$$\qquad\qquad\qquad (.189) \quad (.074)$$

The first clue as to a reason for the discrepancy in the results of the two studies is presented in a footnote of the NCFM study (57, footnote 25, p. 207). When the firms were grouped to yield a minimum size of $100 million in value of shipments, the correlation coefficient was .67. When the groups had a minimum size of $300 million, the correlation was .91. As would be expected, the explained variation was very sensitive to the grouping procedure. Since there is no a priori reason for using one size group over another, this degree of change in magnitude of correlation must cause skepticism of the results. No data were presented to allow an evaluation of the effects of the size of the groups on the level or significance of the coefficients. At the 70 percent level of concentration the estimated equation yielded profits ranging from 14.9 to 15.9 percent. However, plugging the 70 percent

concentration ratio into the quadratic to which the footnote refers (equation (2)) yields results outside this range of profits. This seems to uncover an inconsistency in the reported results which may be an error in estimation or simply a printing error.

To further examine the effect of grouping on the use of averages the same grouping and averaging procedures were applied to the data of the present study as were incorporated in the NCFM study. The observations were first ranked according to the level of the diversified power index and grouped into deciles. Average profit rates were calculated for each decile. These calculations are presented in Table 14.

Table 14. Average profitability of firms distributed by deciles of diversified power

Diversification index	Number of firms	Average profits
.0 - .10		
.11 - .20	25	08.6
.21 - .30	38	09.2
.31 - .40	21	09.1
.41 - .50	6	13.2
.51 - .60	5	14.4
.61 - .70	5	14.4
.71 - .80	3	15.2

There becomes an obvious relationship between average group profitability and the decile of diversified power. These results are very similar to those presented in the NCFM study where average profits were shown to be 7.5 percent for the 21 firms with a power index of less than 40 and 14.2 percent for a power index greater than 60 (57, Table 5, p. 204).

The most significant difference between deciles in the NCFM study was between those firms with diversified power index below 50 and those above 50. The obvious break in the present study occurred at an index of 40. This difference could be explained by the use of 5-digit product classifications in the former study and 4-digit industry classifications in the present study.

The raw data of the present study were grouped according to the two rules of the NCFM study and the quadratic regression was again estimated. The following estimates resulted:

(4) $Y = -.1022 + .9872\ X - .9648\ X^2$

with an R^2 of .79. The coefficients differ greatly from the estimated regression using ungrouped data and from the estimates of the NCFM study. As was mentioned earlier the results of the regression using ungrouped data were not presented in the NCFM study so it is not known what effect grouping had on their estimates.

These results raise the following obvious questions: (1) Why is there such a close positive ranking between average profit rates for the deciles yet correlation and regression analysis based on ungrouped data yield completely unreliable results? and (2) Are the results obtained from the grouped data economically meaningful?

The answer to question (1) lies mainly in the statistical characteristics of the data. In order to have such a low level of explained variance using ungrouped data yet an extremely high level of explained variance with grouped data, the within group variation must overwhelm the between group variance. Analysis of variance on the grouped observations resulted in an $F = 1.5$, indicating that the experimental

error mean square was as large as the mean square for treatments, i.e., the variation within groups is as large as the variation among groups. Thus the hypothesis could not be rejected, on the basis of the data in the present study, that there are no differences among the effects of the treatments (grouped by diversified power) in the experiment. Thus there could be a lack of any central tendency within the groups or the mean could be a poor measure of this central tendency.

The NCFM study reported that the observations were grouped because of the greater variation in profits of the smaller, less diversified firms relative to the larger, more diversified firms. It is not obvious from the data presented in the study that this is the case even though this is usually a legitimate assumption. The shortcoming of this assumption in these data is probably that they were taken from a population of the 1,000 largest manufacturers in 1950. Since food processing is only one segment of manufacturing, this would have included only the large food manufacturers and eliminated the smaller ones that exhibit greater variance in profits. In the large firms there is no reason to believe one group will have greater profit variance than another. Calculation of the relative variation within the groups used in the NCFM study indicated that the group of firms with a diversified power index of less than 40 percent, had a relative variation of 15 percent; group two, those with a power index between 40 and 49 percent, had a relative variation of 9 percent; group three, those with a power index between 50 and 59 percent, had a relative variation of 9 percent; and group four, those with a power index greater than 60 percent, had a

relative variation of 11 percent. Thus there is little difference in the relative variation of the observations about the means of each respective group.

Secondly, the column titled average size firm in Table 13 indicates that the largest firms fell in major group one, i.e., firms with diversified power indices less than 40. This major group had the largest relative standard deviation. Much smaller firms (almost the smallest firms in the sample) fell in major group four, i.e., firms with a diversified power index greater than 60. Thus the reason given for grouping the data is not justified by the data presented.

Whenever group averages are used as observations in regression analysis, the interpretation is different than under the use of individual ungrouped observations (90, p. 105). For example, the per capita consumption of California might be compared to the per capita consumption in Illinois, with these observations regressed on the average size of firms in each state to determine the influence of big business on wages. The results apply to the people of each state, not to persons or individuals within the state. In the NCFM study, the purpose was to determine the relationship between the performance of individual firms measured by the level of profit rates and the structure of the industries in which the firm operates. There is no a priori basis for averaging in this analysis. The results desired should apply to individual firms, not firms grouped by some arbitrary set of rules.

Waugh and Abel indicated the extreme effects averaging can have on levels of significance and lesser effects on the correlation coefficients

(90, pp. 105-115). They recommended that any time group averages are used in regressions, two-way groupings such as those used by Yule and Kendall be adopted and each grouped observation be weighted in the regression by the number of individual observations used in obtaining the average to correct for the effects grouping has on individual observations (90, p. 114). Neither treatment was applied to the NCFM data.

The second question that needs to be considered concerns the logic of the results. It must be recalled that these relationships between profit rates and concentration no longer describe the relationship between average industry profit rates and industry concentration but the relationship between the profitability of firms and the concentration ratio of the firm in each industry in which it has output weighted by the share of the firm's output for each industry respectively. The results can no longer be interpreted as a high relationship between industry concentration and industry profitability.

The firms in the sample are described as being diversified, thus the relationship could be caused by being in numerous industries, or by being in a few highly concentrated industries. The data do not allow a specific pinpointing of the cause. However, the relationships between profits and the share of output in nonprimary activities was shown above to be stronger than the relationship between profits and diversified power.

Second, the index presented a weighted concentration figure that was no higher than the firm's primary industry concentration for 79 percent of the observations in the present study. The index was actually

lower than the primary industry concentration ratio for 60 percent of the observations.

Third, the index makes no account of the degree of nodal commonality of the various products or production processes being combined in a diversified firm. A higher positive relation would be expected if a firm captured a large share of its primary product market and also close substitutes or products where marketing or production know-how could be transferred from the primary product than where there is no relationship between the products or production processes.

Fourth, the diversified firms should be more profitable than the nondiversified firms if diversification is a mechanism by which firms accumulate and use market power. This should be apparent in the relationships between the extent of diversification and profitability (independent of concentration ratios). It was indicated above that this test produced results that were not significant.

Fifth, the predicted values of the equation presented in the NCFM study seem rather unrealistic for the food processing firms (58, Table 13, p. 208). A firm with weighted concentration ratio (or diversified power index) of 70 percent would receive profits of 30 percent on net worth. However, they have no observation groups showing a profit rate greater than 17.4 percent. The equation estimated for the present study using grouped averages would predict a profit rate of 12 percent if the diversified power index were at 70 percent and 10 percent if the index were 30. Thus, the predicted values from this equation are reasonable but the intercept term of equation (4) seems quite highly negative for a year that was relatively profitable for food processors. The time series

data reported in the next section strengthen the fact that there is little difference in profitability of diversified and nondiversified firms.

The sixth point to be made concerning the high relationship and the use of the grouping procedure is implicit in the NCFM table reproduced as Table 13 but never discussed in their analysis. There is an average size firm implicit in each concentration group which has been calculated and added to Table 13. The group which included the largest average size of firm had the lowest average profit rate. A similar result is apparent in the group containing the second largest average size firm. The group with the highest average rate of profitability had an average size of firm among the smallest of all groups. The average size of firm in this group was $59.2 million in value of shipments. The 1950 Source Book of Income Statistics indicates that the 3 or 4 largest firms in most food manufacturing industries (3-digit) were larger than this. The firms in the NCFM study were classified on a 5-digit product breakdown. However, in 1954 the 100 largest food manufacturers held one or more of the leading positions in 95 of the 103 food product classes. Thus, the firms in this size class were not among the largest industry leaders.

This implicit size distribution of firms that accompanies the regression analysis leads one to consider the approrpiate public policy approach. The results seem to imply that smaller firms in highly concentrated industries should be attacked whereas large firms, that might also be in highly concentrated industries but have reduced their total diversified power index by spreading their production over a

number of products, be left alone. This logic has obvious failures and shortcomings.

Thus, the writer concludes that these six points make the results of the regressions using grouped observations highly tenuous and increases the acceptance of the fact that relatively few cases of extreme market power exist where the power is derived from diversification among food processing firms. Also it seems more plausible and realistic to use an index that gives the company's primary industry concentration ratio a weight greater than that of its diversification activities and use another variable, e.g., $\Sigma\ a_i\ C_i - a_p\ C_p$, to account for power achieved from diversified activities. It might be desirable to take a further step and weight the index by the nodal commonality of the products and processes involved. This latter weighting procedure was not followed in the present study.

Summary of Cross-Section Results

To summarize the cross-section results, it can be said that concentration measures of a firm's primary industry, the size of the firm, and the diversified power of the firm as measured in the present study indicated no systematic influence on the performance of firms measured by the profitability of firms and thus account for little of the variation in the profitability of firms engaged in food manufacturing. The same independent variables are positively related to the average gross margins of firms in food manufacturing. The conclusion was reached that this discrepancy indicates that small firms compete by charging

lower prices and having lower costs because less money is allocated to advertising and promotion. Larger firms in more concentrated industries engage in nonprice competition. Product differentiation accomplished through massive advertising and promotion efforts allow the firms to charge higher prices. The cost of these promotional campaigns plus research and development and other overhead costs permit the large firms in concentrated industries to achieve a rate of profitability that is not necessarily higher than that of the smaller firms in less concentrated industries.

When other independent variables are added to the model to explain other common features of structure and conduct, e.g., level of expenditures devoted to advertising and promotion, minimum efficient size plant, and a capital output ratio to adjust for different levels of technology, a statistically significant portion of the variation in the profit rates of firms in food processing can be explained. In the model encompassing the entire set of measures of structure and conduct the predicted coefficients were robust and at an unreliable level of significance. The distributions of the observations used to depict concentration (both primary industry and diversified power) indicated that a positive relationship does exist between these measures at the extreme levels.[40]

The weakness of the degree to which structural measures account for differences in the profitability of firms has implications concerning

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[40]The lack of any significant differences between the results using 4-digit 4-firm concentration ratios, 4-digit 20-firm concentration ratios, or 3-digit average concentration ratios indicates the weakness of concentration ratios. Each measure is a single valued parameter used to approximate the size distribution of firms in an industry. Each of the above measures represents a different part of the size distribution and should yield differing results.

(1) the effectiveness of profit rates as the only measure used in evaluating the performance of firms in industries or markets, and (2) the use of profit rates and structural measures in a case-by-case approach to antitrust enforcement. These implications will be discussed in Chapter VI.

Results of Time Series Analysis

The three hypotheses to be tested with time series data were described in Chapter III. Each of these hypotheses was tested with a 33 percent random sample of the firms used in the cross-section analysis for which profit and total growth data were collected for the 1947-1965 years. The firms were ranked ordinally on the basis of product diversification and placed in four groups as described in Chapter III. Group I contained those firms that were completely undiversified over the entire period; Group II was made up of firms that were nondiversified in 1947 but diversified in 1965; Group III was made up of firms that were slightly diversified in 1947 but witnessed a major increase in the degree of diversification between 1947 and 1965; and Group IV was made up of firms heavily diversified over the entire period. This grouping resulted in 16 firms in Group I, 21 in Group II, 10 in Group III, and 12 in Group IV.

The first hypothesis to be tested is that diversified firms were more profitable over time than nondiversified firms. This hypothesis was tested with a 4 X 3 chi-squared contingency table. The rows of the table represented the four groups of firms, the columns represented three

profit ranges: low profit rates defined as firms with average profits over the period of less than 5.5 percent; medium profit firms were those with profits between 5.5 and 12 percent; and high profit firms were those with profits in excess of 12 percent. The contingency table yielded a chi-squared coefficient of 4.53. Thus, the hypothesis could not be rejected that average profitability over time was independent of the states of product diversification for the food processing firms. Because of the limitations of the data and the tests employed, all that can be said is that diversified firms tend to be no more profitable over time than nondiversified firms. It cannot be concluded from this test that diversified firms are no more profitable than they would have been had they not diversified. The lack of ability to pinpoint the time period when firms made significant changes in their product mix or the existence of multiple changes in the product mix over time eliminated the possibility of testing this hypothesis with the data available.

The average profits of the firms in each group were calculated for each of the 19 years. Trend lines were then calculated for each group to investigate further the profit characteristics of diversified and nondiversified firms.

The trend lines:

Group I	$Y = .081 - .003\ X$
Group II	$Y = .094 - .003\ X$
Group III	$Y = .110 - .002\ X$
Group IV	$Y = .103 - .002\ X$

indicate little difference in the intercept of the four groups. However, the diversified firms had a slightly slower rate of decline in profits than did the nondiversified firms. (The negative slope is caused by

the selection of the high profit postwar years for the initial years in the period.)

The second hypothesis tested was that the highly diversified firms grew more rapidly (in terms of total assets) than the lesser or non-diversified firms. A 4 X 3 chi-squared contingency table was again used to test the hypothesis. The four rows of the table again represented the four levels of diversification. The columns represented: (1) firms that grew by less than 1.3 percent per year; (2) firms that grew from 1.4 to 7.3 percent a year; and (3) firms that grew by more than 7.3 percent a year. A chi-squared coefficient of 6.82 did not allow the rejection of the hypothesis that growth is independent of the groupings of firms according to diversification. It suggests merely that diversified growth is a substitute for horizontal growth. Again the weakness of the test does not allow us to conclude that the firms that diversified would have grown as rapidly as they did had they not diversified.

The third hypothesis tested with the time series data was that diversification is a method used to avert risk and thus reduces the profit instability of firms. Again the data were not available to construct a direct test of this hypothesis. The average variances of the firms in each of the four groups were calculated. The Bartlett's test for homogeneous variances was then used to determine whether or not the average variances of firms in the four groups differed significantly. The Bartlett's test led to the rejection of the hypothesis that the variances of the four groups are equal ($\chi^2 = 13.778 > \chi^2_{(.99)(3)} = 11.3$).

It was then necessary to construct tests to determine the significance of the differences in variances and an ordering of the differences

by groups. The most significant differences were between groups I and IV. The hypothesis was rejected that $\sigma_I^2 \leq \sigma_{IV}^2$ (.995 level of significance). From the previous test they were determined to be unequal leaving only the result that $\sigma_{IV}^2 < \sigma_I^2$. Similarly $\sigma_1^2 > \sigma_3^2 > \sigma_2^2 > \sigma_4^2$. Thus, the average variance in the profitability of firms is lower for the diversified group than the nondiversified group. This would support the Markowitz contention that diversification, even though it may be into cyclical unstable industries, has a stabilizing effect on profit rates of firms.

In conclusion the time series data supported the cross-section analysis with regard to the level of profitability, i.e., the average profitability of the group of diversified firms was not significantly greater than that of the nondiversified group. The group of diversified firms exhibited a more stable level of profit rates than the nondiversified firms indicating the possibility of averting risk through changes in the product mix.

CHAPTER VI. MARKET STRUCTURE AND ANTITRUST POLICY

Structural elements of industries have long been considered important in evaluating firms brought before the courts for antitrust violations. Measures of industry concentration, barriers to entry, and size of firm have long been used in these cases. Thus it is important to consider the implications of the present study on antitrust policy. Since mergers have the most striking effect on changing industry structure--the main independent variable of the present study--this chapter will concentrate on merger policy.

The research studies conducted purporting to analyze the molding forces of our industrial structure indicate that the three major merger waves since 1895 have played a significant role in the development of both firm and industry structures (39, 58). The waves are dated 1898-1902, 1926-1930, and 1946-1956. The importance of these waves is reflected by the fact that at least three-fifths of the 100 largest corporations in 1955 had an important merger somewhere in their history. Thirty-one of these mergers took place prior to 1904 (58, p. 4).

The first merger wave, which peaked between 1898 and 1902, transformed our industry structure from one of small, locally held firms into industries made up of a few very large enterprises. The second wave reflected both the emergence of new industries arising from our industrial development and an attempt to restore the concentration levels of the previous movement that were beginning to deteriorate. The third movement, following the end of World War II, appears to be marked by a lower peak but a longer duration.

It can be said, with due respect for these studies, that the results of attempts to explain the causes of waves are less than significant. In many cases the findings are in conflict. The merger waves appear to have little relation to the rate of industrial growth, the rate of innovation, and the improvement of transportation facilities (58, p. 6). These factors were more significant in the later waves. The early waves appear to be related to periods when the capital markets were strong and the securities markets were favorable. All merger waves are positively correlated to the business cycle. There appears to be little correlation between the legal atmosphere and the merger waves, since one of the stronger waves occurred during and after the strengthening of Section 7 of the Clayton Act. And at present there appears to be a relatively strong merger movement even though in recent years the courts have acted upon cases referring to forms of vertical and conglomerate mergers that were never before brought under the antitrust laws.

The economic and legal aspects of mergers will be discussed with attention focused on the cases dealing with conglomerate mergers. The courts have made a distinction between three types of mergers; horizontal, vertical, and conglomerate. In order to remain consistent with the legal record the horizontal merger is defined as the acquisition of the stock or assets of a firm producing an identical product or close substitute to the products of the acquiring firm and operating in the same geographical market; a vertical merger is the acquisition of the stock or assets of a firm which buys the product sold by the acquirer or a firm from which inputs of the acquiring company are purchased;

and the conglomerate merger is the acquisition of a firm producing a product that has no economic relationship to the acquirer. The courts have tended to use the strict definition for horizontal and vertical mergers and leave the residue of cases fall into the category of conglomerate mergers (67).

Mergers and Antitrust

Merger cases have been brought to court under both the Sherman Act and the Clayton Act. However, both laws, prior to the Celler-Kefauver Act amending Section 7 of the Clayton Act, proved to be quite inadequate in handling the situation. The Sherman Act did not deal specifically with mergers. A merger could be held illegal under this Act only if it represented "...a contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade," or if it reflected "...a person who shall monopolize, or attempt to monopolize, or combine or conspire..., to monopolize..." Thus, it was very easy for firms to by-pass the first section by having no formal contract. Most cases had to be tried under Section 2. Section 2 was equally as troublesome because it required the courts to prove an intent to monopolize whereas most mergers could be justified as good business practice on the part of the firms. Thus only extreme cases of monopoly which involve evidence of an expressed intent to monopolize hold under the Sherman Act.

The Clayton Act, in Section 7, originally stated "...that no corporation engaged in commerce shall acquire, directly or indirectly, the whole or any part of the stock or other share capital of another corporation...where the effect of such acquisition may be substantially

to lessen competition between the corporation whose stock is so acquired and the corporation making the acquisition, or to restrain commerce in any section or community, or tend to create a monopoly of any line of commerce (85, p. 731)." Thus, in 1914 the first law making it illegal to merge through stock acquisition, if competition is substantially lessened or a monopoly tendency is created, was written into the statutes. This allowed firms to be found guilty of an illegal stock acquisition of another firm if such acquisition tended to lessen competition between the acquired and acquiring firms removing the rule that an intent to monopolize had to be proven.

Two major weaknesses can be found in the law as originally written. First, the law did not specify that any distinction be made between horizontal, vertical, or conglomerate mergers. Thus up to recent years only horizontal mergers have been successfully tried under the Act. Secondly, the law did not cover asset acquisitions. Any merger by asset acquisition had to be tried under the Sherman Act which again required the proof of intent to monopolize. The evidence of the problem is shown by the following cases. In Geddes v. Anaconda Copper Mining, Anaconda controlling 22 percent of the copper output of the U. S., purchased another small producer (38). The court said that the relatively small portion added to Anaconda's control did not constitute an attempt to monopolize and thus did not make the merger illegal under the Sherman Act. The Columbia Steel Case involved the acquisition by Columbia Steel, a west coast producer of certain specific fabricated products, of Consolidated Steel Corporation (16). A review of the history of the

case revealed that United States Steel had acquired government plants at Geneva, Utah, which increased its ingot capacity from 31.4 percent to 32.7 percent. The merger was approved by the Attorney General. United States Steel made plans to start a cold-reduction mill in California to fabricate the steel-rolling 'semies' coming from the plant at Geneva. They then altered the plans and acquired the Consolidated Steel Co. which purchased less than 1/2 percent of national consumption of 'semies' but three percent of west coast consumption. By defining the market narrow enough, percentages of market control were increased to the point at which the government felt this merger violated the Sherman Act since it would foreclose a sizable amount of competition as a vertical merger and eliminate competition as a horizontal merger. The court found that this elimination of competition was too small to represent a restraint of trade. In answer to the government's charge of monopolization, the court said that since a monopoly was not achieved, the government must prove an intent to monopolize. The government could not produce evidence of intent.

A similar vertical integration case involved the merger of the Yellow Cab Co. with the Checker Cab Manufacturing Corporation (94). The government charged that the companies had illegally foreclosed 80 percent of the market in Chicago and other major cities by allowing the Yellow Cab affiliates to purchase only from the Checker Cab Co. The court concluded that this vertical integration did come under the Sherman Act. But even though sizable proportions of the industry were involved there was again no proof of intent to monopolize.

In 1950 the District Court of New York held, in the case of the United States v. Celanese Corporation of America, that "A merger with another company...does not constitute an indirect acquisition of stock, although it is an acquisition of the property represented by the stock, and although an acquisition of stock may be incidental to the merger (14)." This loophole was then quickly closed by the Celler-Kefauver Amendment to Section 7 of the Clayton Act. This amendment stated that any corporation under the jurisdiction of the FTC should not acquire "...the whole or any part of the assets of another corporation..., if the effect of such acquisition may be substantially to lessen competition or to tend to create a monopoly." The amendment also included vertical and conglomerate as well as horizontal mergers. In the original version of the law the tests of legality were; (1) the substantially lessening of competition between the acquiring and the acquired corporation, (2) the tendency to create a monopoly related to a line of commerce, and (3) evidence of a restraint of commerce in any section of the country. The amended version of the law removed the first mentioned test of legality and required only that competition be restrained in some market to constitute a violation of the law (18).

Economic effects of mergers

The economic effects of horizontal and vertical mergers are quite apparent. On the negative side the mergers represent a technique through which the firms can greatly increase the concentration of power in an industry.

Having achieved dominant market power they can force competitors out of business by the use of various pricing policies. Once the role of the large firm is felt by smaller competitors in the industry, the dominant firm may effectively set policy and competitive standards for the industry (which may not be considered competitive).

The vertical merger forecloses competition not only between the acquired and the acquiring firms but to other firms that might sell to or buy from the companies involved in the merger.

The negative aspects of mergers are not sufficiently widespread to make them illegal per se. In fact certain respects of mergers are highly desirable. Merger is one technique by which a firm can liquidate its holdings. It is especially beneficial in cases involving family firms in which liquidation might be deemed necessary for personal reasons. It is a technique by which a firm in financial difficulty can gain the skills and know-how necessary to make it an efficient operation. Without the possibility of merger the firm would become insolvent and thus be completely removed from competition. If the firm is merged with a competitor some competition is foreclosed but the assets of the firm still remain as a competitive segment of the industry. Thus a capital assets market provides suitable rewards for successful entrepreneurship and the free transferability directs the assets into the hands of the more efficient operators.

Firms may merge to achieve levels of production that yield economies of scale, i.e. a reduced average total cost of operation. If these economies can be achieved without giving the firm such an advantage as to allow it to drive competition out of business the economies are

desirable. However, if the company gains monopoly power through these economies there is no force present to guarantee that the firm will pass the efficiency gains, at least in part, on to the consumer. The company could charge monopoly prices, earn monopoly rewards and have a serious effect on the efficient allocation of resources. The consumer pays monopoly prices, output is retarded, and the price system is no longer an accurate indicator for the attraction of resources. This point was specifically disputed in the Brown Shoe Case wherein the courts stated that Congress, in passing the law, had intended to "...promote competition through the protection of viable, small, locally owned businesses, even where economies of scale might be gained (11)."

Economics of the amended act

With the amendment of Section 7 of the Clayton Act came a new economic approach to mergers. Section 7 as amended does not deal strictly with either monopoly or pure competition but rather with the monopoly power or market power achieved by firms in an oligopolistically structured market. Monopolistic pricing and predatory activities may be used long before a firm has achieved a monopoly position. These practices along with other anti-competitive activities will be successful depending on the market power of the firm initiating the activity and the relative strength of his competitors. The law and the court's interpretation of the law have assumed a positive correlation between the size of a firm, the number and size of competitors, and the success of anti-competitive activities. Therefore, concentration and trends in market concentration play a dominant role in determining the possible anti-competitive effects of a merger.

One serious problem with concentration measures and oligopoly theory is that there exists no clearly measurable division between competitive and noncompetitive industries nor between mergers that are substantially anti-competitive and mergers that are not to be substantially anti-competitive. Therefore, any guidelines to be used by business have come from the Supreme Court decisions and the regulatory agencies. In the Continental Can Case (2) once the courts had defined the relevant market, they found that the control of 25 percent of such market by the merged firm approached that held by the merged firms in Philadelphia National Bank (67) and Alcoa (2) thus setting a basic ground rule for determining the upper limits of market share needed to substantially lessen competition. In the Brown Shoe Case the court stated that if there has been any trend toward increased concentration in an industry, any further mergers, regardless of how small, might represent a tendency toward decreases in competition[41] (11). This rule was again used in the Von Grocery Case (88). The combined rulings seem to imply that any merger accounting for in excess of 25-30 percent of the market will be subject to antitrust action. Mergers accounting for a smaller market share will not be tolerated if the above mentioned changes in structure are present.

The courts as well as Congress have shown that the intent of the bill was to stop economic concentration in its incipiency. This places special emphasis on information indicating any trends toward high concentration in an industry. It also makes any possibility of acquiring

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[41]The government has more recently used this ruling in a case being brought against the Pabst Brewing Co.

proof of guilt of actual anti-competitive practices by firms delusive. It assumes a direct relationship between concentration and competition and disregards efficiency. Therefore, the courts must judge the cases on the probable and potential effects the merger or change in concentration will have on competition. Three 1963 Supreme Court cases clearly indicate the significance the courts are placing on potential competition.

The Continental Can Case involved the purchase by Continental Can of Hazel-Atlas Glass Company (21). Continental Can produced no glass containers and Hazel-Atlas produced no metal containers. The courts defined the relevant market to be the glass and metal container industry and found that this merger would substantially lessen competition since glass and metal containers were being used as substitutes in the soft drink and beer industry. The cross elasticity of demand and inter-changeability of use were used to determine the relevant market. The court said that "...in determining anticompetitive effects (one) must look at the structure, history, and future of the market involved (21)." The Penn-Olin Case involving the formation of a joint subsidiary for the production of sodium chlorate was declared illegal on the grounds that it could foreclose competition between the parent companies even though the subsidiary did not contain a sizable portion of the market (65). In the El Paso Natural Gas Case the courts cited the merger with Pacific Northwest Pipeline Co. as illegal since it again represented a potential threat to competition (even though the District Court found that Northwest could not put together a project to serve California with natural gas acceptable to the regulatory agencies). The purpose of

Section 7 is "...to arrest the trend toward concentration, ..., before the customer's alternatives disappear (ed) through merger... (66)." Since the gas industry is greatly expanding the courts found this merger to be a threat to competition.

To clarify the rule the courts disregarded the potential injury to competition in the Lever Brothers Case (48), and in the Crocher-Anglo National Bank Case (22) and stated that potential competition cannot realistically be lessened if the markets are geographically set apart. Also, in Crown Zellerbach the court said that the potential to produce does not insure the potential to sell. However, in Brown Shoe they indicated the need to take into account the convertibility of plants (11).

It appears as though the action in Continental Can, El Paso Natural Gas, and Penn-Olin cited above will tend to lessen the number of conglomerate merger cases since many mergers which previously would have been considered legal may not be such, when the market is defined to include potential competition that might arise between the two firms.

These cases clearly come under the law which was reworded to include not just harm done to competition between the acquired and acquiring firms but substantial lessening of competition "...in any line of commerce in any section of the country... (81)."

Conglomerate mergers

The effects of a conglomerate merger on competition are not as apparent as those of the type described in the first part of this paper. This, in turn, causes a need for a reconsideration in the tests of legality.

Concentration in any one market may not be increased as an immediate result of the merger. But the combined market power derived from being in various markets may give the firm leverage to operate in a manner not open to single product firms. Such vague concepts as the ability of these firms to (1) shift vast financial resources into single markets, (2) create barriers to entry merely by possessing such a powerful threat to new entry, and more relevant economic concepts such as the ability to achieve economies of scale not open to the single market operator must be considered in the economies of mergers in the conglomerate area. Few cases have dealt specifically with conglomerate mergers and those doing so date back only to about 1957. Therefore there is little established record indicating just how these mergers are to be handled.

Turner has listed a number of possible effects of conglomerate mergers (78). These will be discussed in turn.

First, the conglomerate merger may enable the acquired firm to operate at a lower cost of production due to economies of scale in distribution, promotion, management , research and possibly in the acquisition of capital. If the economies of scale are sufficiently large, the merger may drive less efficient single product competitors out of business in the industry of the acquired firm. It is up to the courts under the present antitrust policy to decide whether or not these mergers are illegal because of the efficiency gained over competitors.

In the Brown Shoe Case the courts gave some indication of their position on economies of scale gained through merger (11, p. 344). Brown Shoe Company, a producer of shoes, acquired the G. R. Kinney Co.,

Inc. which operates a retail chain of shoe stores. The retail outlets could purchase directly from the producer eliminating the wholesaler and thus reducing distribution costs on their own brands of shoes. The court concluded that this could result in driving competitors out of operation thus reducing the level of concentration in the industry. The retail shoe industry is relatively non-concentrated so this represented a foreclosure of a small segment of the market. The merged company accounted for less than five percent of both the production and sale of shoes. The court, after stating that the antitrust laws were to protect "competition, not competitors," continued by saying that they must not "...fail to recognize Congress' desire to promote competition through viable, small, locally owned businesses (11)." Although they did not specifically indicate that mergers were illegal because of efficiency gained, they did allow the latter aspect, the protection of small competitors, to take precedence over these efficiencies. Similarly, the court disregarded the stimulus this merger might have, if increased efficiency is involved, for increased efficiency in other firms in what is obviously an atomistically structured industry.

From a purely economic point of view it might be quite difficult to justify a conglomerate merger on the basis of scale economies since with purely conglomerate products it seems unlikely that any such economies will exist at least in production and distribution. Even with such purely conglomerated products there may be economies in promotion and capital costs. Turner found that capital costs declined with increases in the size of plant. However, it must be remembered that the legal definition is not so pure as to include only this narrow class

of mergers as conglomerate. It also includes product extension and market extension mergers.[42]

Product extension mergers may enable the firm to produce products not in the same market as the firm's primary product but similar to the primary product in many respects, e.g., distribution, production, promotion. It is highly feasible to expect economies of scale in these types of mergers.

The second factor concerning diversification or conglomerate mergers is that the diversified firm may find it profitable to cut its price in one product market to gain customers, cushioning it's losses in this market by gains in other diversified areas. This may be of a predatory nature or otherwise. If it is of a predatory nature with specific intent to reduce competition and drive competitors out of business the action is illegal per se under Section 3 of the Clayton Act. This predatory action must be separated from a competitive attempt on the part of the diversified firm to improve it's position in the sale of one product by using another product as a loss leader. This type of price cutting could force increased efficiency in one market. Predatory price cutting presents the same problems when connected with conglomerate mergers that the practice presents when used independent of any type of merger. If the pricing policy substantially lessens competition in any market and if the power to use such a pricing policy is derived from mergers there are no apparent reasons why the merger or the practice should be accepted. At the same time there is no reason to assume that every

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[42]A purely conglomerate merger has never been tried in the courts.

conglomerate merger places a firm in a position to use predatory pricing policies or that every merger is promoted in an effort to achieve the potential to use of such policies.

A third possible consequence of conglomerate mergers is that competition in the industry of the acquired firm may be restricted because the existing firms may be afraid of retaliation from the new diversified firm, and in the same manner new entry is deterred because of the same fear of the diversified firm. This fear comes from the fact that the diversified firm may be able to transfer massive amounts of power from one industry to another. This power might be transferred in the form of pure size, financial strength, promotional experience, or the use of similar selling and distributional facilities. The measurement of potential competition is extremely vague and demands much more care in its interpretation than it has been given by the courts. Theoretically, if excess profits are high enough in a given industry, anyone with lower profits in other industries and capital availabilities is a potential entrant. Thus potential competition can be a very real competitive force. But the capital availabilities of other firms and numerous other factors may limit the number of potential competitors. The fact that a firm has studied the possibility of entering a given product line does not make them a potential competitor (31).

Two recent decisions indicate the courts' position on the transferability of power and potential competition. The Procter & Gamble Case represents the most recent and widely publicized case ruled upon by the Supreme Court as a conglomerate (product extension) merger (19, p. 15, 773).

The Procter & Gamble-Clorox Case

In 1957 Procter & Gamble purchased Clorox, a bleach producer. The Federal Trade Commission issued a complaint on September 30, 1957, against Procter & Gamble (P & G) charging that it had violated Section 7 of the Clayton Act by its acquisition of Clorox Chemical Company August 1, 1957. After evidence was heard by P & G appealing the decision, the Commission, on June 15, 1961, entered an order remanding the case to the hearing examiner for the reception of post acquisition evidence. The Commission stated that, at this time, there was not sufficient evidence to declare the merger illegal (29, pp. 3-4). The Commission filed a Second Initial Decision on February 28, 1962, in which an order of divestiture was made. The decision of illegality was based on the probable lessening of competition in the liquid bleach industry for one or more of seven reasons (29, pp. 61-62). On November 26, 1963, the Commission issued the Final Order requiring the divestiture of Clorox by P & G. This order modified the earlier decision by allowing for a spin-off type divestiture (30, pp. 1-3).

This final order was based on finding five major areas where the merger could cause a substantial lessening of competition in the liquid bleach industry. The decision of the Commission was upheld by a unanimous vote of the Supreme Court in a decision delivered April 11, 1967, thus reversing an earlier decision of the U. S. Court of Appeals for the Sixth Circuit (31). The five areas of contest will be reviewed here after going through a brief history of the markets involved.

The relevant line of commerce was determined to be the household liquid bleach industry. Although there is some overlap between liquid

bleach, industrial bleach, and powdered bleach the evidence presented concluded that (1) industrial bleach is a much stronger solution than the 5-1/4 percent sodium hypochlorite solution used in household liquid bleaches and (2) dry bleaches are of a light duty nature whereas liquid bleaches are heavy duty, the former being approximately twice as expensive as the latter and primarily used in bleaching fine fabrics that cannot withstand the heavier bleaches (30, p. 40). Therefore, there is enough distinction in the markets to consider the liquid household bleach market as a separate entity. Concepts of cross elasticity of demand were used in this determination. The court did not mention the substitutability of household detergents containing bleaching ingredients and presented little evidence of the price interdependence among the products.

The relevant geographic market was determined to be the United States and a number of regional submarkets. Since Clorox is the sole national producer of bleach the national market was considered but the more relevant impact of the merger was said to be in the various submarkets where Clorox had different competitors and different market shares. (Purex was not considered a national corporation even though they sold in areas of the country representing 64 percent of the population.) (30, p. 40-41). The household liquid bleach industry at the time of the merger was characterized by high concentration, six firms accounting for 79.8 percent of total U. S. sales. Clorox, with annual sales slightly less than $40 million, accounted for 48.8 percent of total national sales, and Purex, the next ranked competitor, accounted for 15.7 percent (30, p. 5). Purex, unlike Clorox, produces a number of other products in the areas of soap and household cleaning agents.

The remaining 20.2 percent of the market not accounted for by the six largest firms was shared by approximately 200 small local and regional producers. Most of these 200 firms had assets of less than $75,000 (30, p. 6).

Bleach is characterized by a low sales price relative to the volume of the commodity. Thus, freight costs commonly average more than 10 percent of unit costs making it unprofitable to ship bleach more than 300 miles from the location of the manufacturing plant, allowing for the regional nature of competition (30, p. 1). Although Clorox and Purex had the same number of plants they compete in less than half of the nation (30, p. 42).

In the regional markets, Clorox, in 1957, accounted for 56 percent of sales in New England, 64.3 percent in Metropolitan New York, 71.6 percent in the Middle Atlantic States, 42.4 percent in the East Central States, 28.6 percent in Metropolitan Chicago, 34.5 percent in the West Central States, 52.6 percent in the Southeast, 48.4 percent in the Southwest, and 39.2 percent in the Pacific. The largest regional market share held by Purex was 42.4 percent in the Pacific region (29, p. 19).

Clorox had also achieved, through advertising, a brand allegiance not attainable by most other bleach manufacturers because of their financial limitations.

In 1957 P & G had total net sales of $1,150 million. P & G manufactured a number of low-priced, high-turnover items in the following areas: soaps, detergents and cleansers; food products; toilet goods; and paper products. These products are complementary to household

liquid bleach in that some may be produced with similar facilities, marketed through the same channels, and promoted by the same means (31, p. 9). Therefore the merger is more accurately classified as a product extension merger than a purely conglomerate merger. P & G, the principal producer of soaps, detergents, and cleansers, along with two other competitors account for over 80 percent of total sales of these products. P & G was in turn the nation's largest advertiser in 1957 spending approximately $80 million (principally television advertising) and $47 million dolalrs for domestic sales promotion (30, p. 12).

After a two-year study of the liquid bleach industry P & G decided it would not be advisable to enter the industry directly because of the apparent requirement of a heavy investment if a substantial share of the market were to be achieved. They did recommend entry by acquisition of Clorox.

With this background focus can be shifted to the five economic reasons used as a basis for the Commission's complaint and order of divestiture. The Commission declared that since this merger was not of a horizontal or vertical nature present quantitative evidence of immediate reductions in concentration or foreclosure of competition cannot be used as evidence. Thus, if mergers of this type are to be judged by the courts it must be accomplished by rough estimates (possibly qualitative) of the mergers' effect on competition in the relevant market (30, p. 53).

In the Clorox Case the first important factor is the great discrepancy in size "...between Procter and, not only Clorox, but any firm in the liquid bleach industry (30, p. 53)." The Commission argued

that, because of the sheer size of the merged company and the relatedness of the products, there is little doubt as to the existence of substantial cost savings which would give the acquired firm a "substantial" competitive advantage in the industry. These cost savings are particularly relevant in advertising. The effectiveness of advertising on low-priced, high-turnover items seems to be closely related to the volume of advertising. The court did not, in the same qualitative vein, consider how much monopoly power could influence price via the demand for liquid bleach even if these economies allow it to accumulate monopoly power.

Also related to the size factor is Congress' intent to protect small business in the amended version of the law. This merger could place the small business firms in this typically small business industry in great jeopardy. In an effort to remain in business, the small companies could seek out large companies willing to merge. This would convert a small business industry into an oligopoly of giants (30, p. 55).

Second, at the time of the merger the household liquid bleach industry was already highly concentrated. Even in the existence of this high concentration the courts said there was evidence of price rivalry and product convenience competition. Procter's entry could stop any possible deconcentration and create barriers to entry. Feared much more than Clorox, however, the Commission produced evidence citing a reduction in the increases in concentration from 1953 to 1957. Subsequent to the acquisition these marginal changes reversed direction (29, p. 31). Procter could even use it's dominant position in the bleach industry to reduce competition in other markets. Clorox could be used as a

"...tying product, loss leader, or cross-coupon offering..." on present Procter products or new products the company may choose to introduce (30, p. 60).

One is reminded here of the statement of Judge Hand relating to a monopoly case in the 1940's: "That percentage (90 percent of the relevant market) is enough to constitute a monopoly; it is doubtful whether sixty or sixty-four percent would be enough and certainly thirty-three is not." Clorox at the time of the merger accounted for 50 percent of the household bleach industry. The next largest producer was approximately one-fourth the size of Clorox and in many sections of the country much smaller. The relevant question again seems to become how much more monopoly exploitation could come from the merged company that was not already being achieved by Clorox?

Third, Procter, because of the similarity of its existing product lines to bleach, its admitted knowledge of marketing low-priced, high-turnover items, its size and record of growth and addition of product lines, was a very significant potential competitor. It has been pointed out by Bain that a potential competitor may have enough influence on a market to cause the oligopolists to charge a price far below the monopoly price making it unattractive for entry (5, p. 189). Potential competition in this way plays a role very much like real competition in regulating the oligopoly price.

In the Procter Case the merger was said to have eliminated the most probable entrant and possibly the only prospective entrant into the liquid bleach field (30, p. 61). The merger was then regarded as a substantial lessening of competition in the household liquid bleach industry.

Fourth, Procter, because of the strength it derives from its already diversified base, was said to possess great leverage that may be shifted into the bleach industry at will. The flexibility given Clorox by the merger was manifest in the Erie, Pennsylvania incident. Clorox effectively, through rapid response, won a market share battle with Purex by extensive advertising and promotion that had not been used extensively before. Purex, by promoting bleach in a new container using Erie as a test market, won more than 30 percent of the market. Clorox, using extensive advertising, "price-off" coupons and premium offers forced Purex's share to seven percent (30, p. 10). This was considered to be a clear indication of the power amassed by the merger. This power must certainly be considered as a retarding factor to any new competition in the industry.

The concept of market leverage required the existence of certain conditions in other markets in which the firm competes. The firm must have significant monopoly power in its primary industry if it is to shift resources and power into other market areas without facing potential harm in its primary market. For example, a time when P & G resources are being devoted to capturing larger shares of the bleach market would be an ideal time for its competitors in the soap and detergent market to attempt to capture a segment of P & G's share of these markets. Thus, the parent must hold a strong monopolistic position in its primary (or in fact any other) industry in which it produces goods and does not wish to loose its market share.

Fifth, the merger gave Clorox a chance to achieve advertising discounts, and efficiency in production and distribution not possible

prior to the merger (30, p. 64).

First, a number of personnel from P & G were placed in high positions in Clorox spreading their technical marketing know-how into this new area. If P & G were to use its sales force to promote and sell Clorox rather than the conventional broker system this could further increase economies in the distribution of Clorox.

Second, plants in Kansas City and Boston were closed because in the Kansas City case P & G felt production could be more efficiently operated if the plant was moved to the location of the Kansas City P & G plant. In the Boston situation it was felt that the Eastern territory could be more economically served from the Jersey City Clorox plant (29, p. 28).

The most significant impact of scale economies was to be felt in the areas of advertising and promotion. Immediately following the acquisition Clorox adapted promotional programs using price-off labels, free premiums, price reducing coupons, and other premiums. These methods of promotion had not been used by Clorox for a number of years (29, p. 30). It is somewhat distracting from the government's case to admit that these promotional techniques had been used in the bleach industry at some date prior to the merger and were used at this previous date by Clorox. Thus, this was not a promotional innovation introduced in this industry by P & G.

In advertising, Clorox made many changes after the merger. Advertising policies in magazine and radio media were altered. In spot television advertising, the total monthly average number of seconds used increased from 49,234 before the acquisition to 100,257 after the

acquisition (29, p. 35). This increase in advertising came at a great unit cost reduction because of advertising discounts. A total coordination of the P & G and Clorox advertising could result in even further savings. Maximum volume discounts available in network television advertising were 25-30 percent. Clorox, prior to the merger probably did not advertise enough to receive discounts of any substance. Purex, in advertising all lines of its products received a six percent discount from one network and 15 percent from another. The combined Clorox-P & G advertising budget could entitle Clorox to at least 33-1/3 percent more advertising for the same money (29, p. 44-45). These savings by a dominant firm in an industry not characterized by massive advertising could have a very significant influence on the many small companies that can muster up, at most, small amounts of finances for local advertising. And since Congress expressed, in debating the law, a desire to protect small local competitors, these efficiencies could only harm local competition and create additional barriers to entry. However, evidence was not produced that indicated that P & G received this level of discounts.

On the basis of these five factors divestiture was ordered by the Commission and upheld by the Supreme Court. Past acquisition evidence was given little weight in either decision. Instead the findings of the Final Order and the Court Decision were based on the potential effects of the acquisition.

Justice Douglas, in delivering the Court Opinion, stated that, contrary to the Court of Appeals, possible effects must be heavily relied upon if anticompetitive practices are to be arrested at their incipiency (31, p. 8). All mergers regardless of type are to be judged under the

same standard, i.e., if the merger or acquisition has the potential to substantially lessen competition in some line of commerce in some section of the country. And Justice Douglas went on to state that the probable anticompetitive effects of this merger are (1) to allow for the substitution of a very powerful firm for an already dominant firm which will increase barriers to entry and dissuade smaller competitors from aggressively competing and (2) to eliminate the most likely and only potential competitor (31, p. 8-9). Therefore, the ruling the the Court of Appeals was reversed in favor of the Commission.

Justice Harlan, in a concurring opinion, stressed the need in this new area of mergers for a better explanation of the Commissions' findings and the Court's ruling to establish "...future administrative and judicial application of Section 7 of the Clayton Act to this kind of merger... (31, p. 1)." Also he heavily stressed the importance and application of the theories and research of Bain in the evaluation of mergers and other features of industrial organization. Economic research, although admittedly incomplete in the area of oligopoly and industrial organization, was given its first real promotion in the Courts by Justice Harlan.

The Reynolds Metal Case is the first judicial test of amended Section 7 relating to conglomerate mergers (60, 67). Reynolds, producing 40 percent of the aluminum foil and being the largest producer of the product, in 1956 acquired Arrow Brands, Inc., a firm to which Reynolds sold foil for the purpose of converting into florist foil. Arrow controlled 33 percent of the florist foil market. The relevant market was determined to be the florist foil market. Using this as the relevant market the courts found that this "conglomerate" merger would substantially

lessen competition. The courts tried this case as a conglomerate merger only after finding that the evidence would not support the fact that Reynolds had illegally foreclosed competition by a vertical merger. Under the definition of vertical mergers given above this type of policy in confronting this merger is inconsistent with both economics and law and must be evaluated in this perspective. Their argument in supporting the decision that the merger should be dissolved was that Arrow now had access to huge financial resources that would be transferred from Reynolds, thus giving them an undue competitive advantage. The fact that the products of Reynolds and those of Arrow are in no way complementary and that the Reynolds brand would be of little advantage to Arrow were discounted in the case. A note in the Yale Law Journal points to a number of tests that could have been used in the Reynolds case since there were approximately ten years of post acquisition evidence available to and acceptable to the court (60, p. 1271). If competition is substantially reduced by the merger there should be barriers to entry. There might be evidence of price cutting of a predatory nature. The courts used neither of the tests. It appears as a case similar to the Brown Shoe Case in which the courts were protecting competitors at the possible expense of increased efficiency. The transfer of power could enable a more efficient means of production which could in turn eliminate a number of small competitors. In the Reynold's Case the court stated that there would be cases where mergers are necessary to preserve competition at adequate levels or to produce "countervailing, competitive, economic, or social advantages (60)." Thus, they did not want the ruling of this case to be considered a per se rule. However, "countervailing" and "social advantages" are

new terms in antitrust that were not defined in an economic framework and leave the rule of law extremely vague.

Reciprocity

Diversification may take place so that a firm might gain power, prestige, profits, stabilization, obsolescence of product lines or as a protection against monopoly prices that might some day be asked for a commodity that the firm buys. Closely related to this last factor is the concept of reciprocity which has been brought to attention by the recent Consolidated Foods Case (20). Reciprocity, however, is not as new as this case. For the conglomerate firm this is one way to improve sales and deny competitors equal access to the market.

Survey results published in 1961 disclosed the fact that 100 percent of those questioned in the chemical industry, petroleum industry, iron and steel industries considered reciprocity a significant factor in their buyer-seller relations (71, p. 70). Of the 300 purchasing agents responding to the questionnaires, 72 percent indicated the importance of reciprocity in their selling activities. It is common in the theory of trade relations to assume that "...every purchase earns a purchase credit...(40, p. 875)" which obligates the seller to buy from the buyer. The value of the purchase credit depends upon the importance to the supplier of the company's purchase, the volume of products the supplier demands, and the amount of reciprocity the supplier might have over the buyer (counter-vailing reciprocity) (40, p. 875-876).

Turner elaborates on these conditions by stating the following five necessary conditions if reciprocity is to significantly influence

purchasing decisions (78, p. 1387). First, assume that there are three firms engaged in the system--A, B, and C. A sells a product to B, B in turn sells a product it produces to C. A conglomerate merger takes place between A and C. The conditions for reciprocity are then:

(1) the conglomerate firm must either be the only firm both selling A and buying B or it must be one of the leading buyers of B.

(2) the conglomerate firm must be a relatively substantial buyer of B (to gain a sizable amount of purchase credits).

(3) If the conglomerate firm is a distributor rather than a user of B's product, it must have some degree of monopoly power in its market in order to have leverage over B.

(4) Industry B must be imperfectly competitive.

(5) Industry B must account for a substantial part of the sales of A, or reciprocity could not affect a substantial foreclosure of competition in the market.

In the absence of reciprocity the economic man acting as the decision maker for the firm will choose to purchase commodities or resources from the firm offering the price-quality combination that most exactly satisfies his need. Reciprocal dealing can only hinder this competitive purchasing. It may force the purchaser to buy from a less efficient, low-quality, high-cost producer. And in doing this it can foreclose a sizable segment of the market. Thus, to gain protection from counter-vailing reciprocity and to protect or enhance sales, the firm is faced with a strong incentive to diversify. This leads to a system of power building upon power which could, if the five conditions mentioned above

are met, lead to a substantial lessening of competition. Before condemning all reciprocity as illegal it must be realized that the make-up of barter is such that some reciprocity must be expected as a normal part of the buyer-seller relationship. However, since any amount of reciprocity hinders the efficiency of the competitive process, reciprocity should be held to a minimum. The court's implication that, in the absence of coercion, reciprocity is generally legal is quite liberal (3, p. 118).

In the 1930's the FTC brought three cases involving reciprocity under the "unfair methods of competition" clause of the FTC Act. In 1931 the FTC charged the Waugh Equipment Company with reciprocal dealings that involved unfair methods of competition (91). Arthur Moeker, Frederick W. Ellis, and J. B. Scott, who were vice-presidents of Armour & Co., (Scott being vice president in charge of traffic control), owned sizable amounts of stock of the Waugh Co., a producer of draft gears for railroad cars. Scott would ship Armour's products only through rail companies using Waugh equipment. Their shipping amounted to about 250,000 carloads per year making the sum sizable enough to warrant, in the eyes of the FTC, action as an unfair method of competition. The Commission ordered the defendants to cease and desist the practice. The companies complied with the order.

In 1932 the Commission brought similar action against Mechanical Manufacturing Co., again a producer of railroad equipment controlled by R. O'Hara and W. A. Mayfield, the manager and assistant manager of traffic control for Swift & Co. (54). Swift was shipping only through rail firms using mechanical equipment. The case again ended with a cease and desist order.

Another similar case involved the California Packing Corporation (12). California Packing indirectly owned the Encinal Terminals, a wharfinger at Alamedo, California, owned directly by the Alaska Packing Company. California Packing would purchase materials only from firms using the Encinal Terminals.

These three cases stress the coercive nature, the basis of power, and the foreclosure of the markets to competitors thus suppressing competition in these reciprocal dealings. The supplier, having no occasion to purchase products from the merged firm, is likely to be foreclosed from competition. However, the Commission had only limited power in these cases since Section 5 of the FTC Act was determined by the courts to require the proof of coercion.

The most recent case is the 1965 Consolidated Foods Case which directly follows the pattern of firms A, B, and C in the hypothetical example given above (20). Firm A is Gentry, Inc., a producer of dehydrated garlic and onions used in the production of soup; firm B is a soup producer buying dehydrated garlic and onions from Gentry, and firm C is the Consolidated Foods Corporation, originally a wholesaler of food products that purchases soup from companies in category B. In 1951 Consolidated acquired Gentry in a conglomerate merger. Justice Douglas in delivering the opinion of the court stated that "...reciprocity made possible by such an acquisition is one of the congeries of anti-competitive practices at which the antitrust laws are aimed, if the probable consequence of the acquisition is to obtain leverage in one field or another (20, p. 913)."

In 1950, prior to the merger, Gentry had about 32 percent of the total sales of dehydrated garlic and onions, or 28 percent of the dehydrated onion market and 57 percent of the dehydrated garlic market. Together with Basic Vegetable Products, Inc., they accounted for about 90 percent of the industry output. In 1958, Consolidated sent letters to its distributing divisions which read in part as follows:

> "Oftentimes, it is a great advantage to know when you are calling on a prospect whether or not the prospect is a supplier of someone within your own organization. Everyone believes in reciprocity providing all things are equal...
>
> "Attached is a list of prospects for our Gentry products. We would like to have you indicate on the list whether or not you are purchasing any of your supplies from them. If so, indicate whether your purchases are relatively large, small or insignificant...
>
> "Will you please refer the list to the proper party in your organization... If you have any special suggestions, as to how you would be helpful in properly presenting Gentry to any of those listed, it will be appreciated (20)."

The courts found a strong indication that food processors did not regard the products of Gentry as being of equal quality to those of competitors. A typical indication is the following reply from Armour stating that they would "...assure (Consolidated) that it is the desire of our people to reciprocate and cooperate with you..., and (we are) sure that if our quality obstacles can be overcome, your quotations will receive favorable consideration... (20)." The Supreme Court decided that the connection between Consolidated and Gentry would allow reciprocity to be used that would give Gentry an unfair advantage over its competitors. In effect the court, ruling against the merger, shifted from the position stated above--that reciprocity in the absence of coercion

is legal--to the position that the potential or the existence of the power to reciprocate is a violation if it could substantially lessen competition.

Reciprocity, as was mentioned above, can be recognized both in an organized form or as nonsystematic friendship buying as part of barter. As Hausman has pointed out a firm using organized reciprocity usually follows an organized course of conduct, the suppliers are chosen as a class to operate on, the sales and purchasing agencies operate together and share information, and the firm as a whole operated in such a manner as to purchase from customers whenever possible (40, p. 881). As a solution to the problem Hausman suggests making the following actions illegal per se: (1) simple reciprocal dealing agreements when used other than in the course of genuine barter; (2) forcing reciprocal agreements; and (3) systematically using purchases as purchasing power for sales purposes (40, p. 882).

These per se rules might function properly in a case such as the Northern Pacific Railway Case in which the railway company compelled the grantees or lessees of land owned by the railway to ship anything produced over their routes providing the rates were competitive (59). However in cases such as those mentioned above (e.g. Consolidated Foods) these factors are not readily identifiable, violating the first necessary condition set down by Kaysen and Turner for the effective use of per se rules. Likewise the per se rules would not be effective in cases involving internally generated diversification. Since reciprocal buying involves a distortion in competitive efficiency, any case where there is a high probability of reciprocal dealing or an indication of such action should not be tolerated by the courts.

Conclusions

The conclusions that can be drawn from the case history relating to conglomerate mergers are very limited. The Reynolds-Arrow merger was vertical, not conglomerate, from an economic point of view. The cases involving reciprocity deal specifically with conduct or potential conduct.

The Clorox Case does involve product extension, which is one form of conglomerate merger, but the product is closely related in function, type, and distribution to the products of the acquiring company. Therefore, little is learned from this case about the court's reaction to mergers where the products are further removed. Clearly, product extension mergers come under Section 7 of the Clayton Act and currently are to be judged by the same standards as other mergers.

Second, the courts stressed very strongly the merged company's ability to shift power into various markets. Where the merged company greatly dominated any other company in the relevant markets, the merger should certainly be suspect. But this does not appear a sufficient condition for the existence of anticompetitive performance.

Third, potential competition and its elimination must be given significant weight especially if the market being entered is already highly concentrated or if there is a tendency toward increased concentration in the market. But again the potential entrants are not only those firms that have studied the possibility but includes many other firms.

Fourth, economies of scale, particularly in advertising and promotion, will be held in low regard by the court if they endanger competitors and should be so held.

But, as Justice Harlan stated in his concurring opinion, this decision is very lacking of any guidelines for mergers in this area. Further evidence of the effects of conglomerate mergers and diversification mergers must be forthcoming from economic research to provide a basis for regulatory policy in this area.

Revisions of Antitrust Policy Suggested by Research

One of the specific intents of the present study was to provide empirical evidence in support of the use of structural measures in determining the extent of competitive or noncompetitive performance in food processing. The results of this study do not support this policy criteria. Concentration and size of firm were not significantly related to profitability. Primary industry concentration and a measure of diversified power explained a highly nonsignificant amount of the variation in profitability. Only when all of the measures of structure and conduct were included in the model could a significant amount of the variation in the profitability of food processing firms be explained. Even in this case the most significant explanatory variables were the variables to adjust for differences in the levels of technology, the minimum optimal size plant, and primary industry concentration. The cumulative effects of advertising played a significant role in explaining profit variation but this aspect of competition is seldom considered in antitrust cases. In this model the regression coefficients on primary industry concentration, absolute size of firm, the ratio of advertising to sales, and the diversified power index were not reliable because of large standard errors.

It must be recognized that profitability measures are only one of a number of possible measures of performance (but a commonly used indicator of monopoly performance with regard to efficient resource allocation). It was revealed in an earlier chapter that food industries show as much productive efficiency as national averages for all industries. Food prices have risen less than a number of other commodity prices. There have been a number of technological innovations in the food industries and large firms have carried on research and development programs.

Thus, one might suspect that the structural measures are not highly related to these other measures of performance even though empirical tests were not conducted. In addition to these features, it was found that in a number of industries the absolutely largest firms are not the most profitable.

The results of this study do not allow generalization over the entire economy since the food processing sector was the only area of manufacturing area covered. Undoubtedly most of the comments to be made relative to antitrust policy carry high degrees of validity in other areas of production.

High concentration levels in a given industry are at most necessary conditions but certainly not sufficient conditions to conclude that monopolistic performance is present in a given market. Concentration levels can at best act as a warning signal, but not as an adequate indicator of anticompetitive practices.

The relevant market must be defined if concentration measures are to be calculated. Much more consistency could be used by the regulatory agencies in defining the relevant market. A distinction must be made

between the relevant market and the industry in which the involved product is classified. Economic theory makes this distinction in both demand theory and production theory. In demand theory the market demand for a given commodity assumes quantity demanded is a function of not only the price of the commodity in question but also the price and availability of other products (substitutes and complements) in the market. Thus antitrust policy must be concerned more with market structure than industry structure.

The first policy recommendation is not one of a general change in the laws but a change of interpretation of markets. A broader interpretation of the market is needed that takes into account close substitutes in the domestic markets that come from either domestic production or imports. This will require more evidence relating to cross-elasticities of both supply and demand and increased measures describing inter-commodity price sensitivity and commodity substitutability.

This approach will not eliminate the borderline cases. But more empirical evidence in the public record could yield better guidelines for business and enable the court to provide more consistency in market delineation from one case to another. This could eliminate many of the market delineations of the types made in previous cases that have been considered decision oriented by many writers (10).

The second point to be made again calls for an alteration in the interpretation of evidence, not a general change in the laws. This point is that a reduction in the number of plants or companies (which has attracted so much attention to the food manufacturing sector of the economy) in a particular industry is neither a necessary nor

sufficient condition for anti-competitive activities in a given market. To make these anti-competitive accusations it is necessary to be able to determine whether the firms are being driven out of the industry by monopolistic pricing policies or by their failure to maintain levels of efficiency consistent with those of their competitors. If the latter is the case, as it has been with "Mom and Pop" food stores, creameries, canneries, etc., in a number of the food industries, the disappearance of firms is an indication that the price system is re-allocating resources. Of course in the latter case if the plaintiff can prove that economies of scale or other means or production efficiency are not present the courts must determine if anti-competitive practices were used by the defendant. This approach requires much more than structural information.

This concept relating to the use of changes in the number of firms can be expanded and applied to other structural measures. Until more is known about the relationship or lack of relationship between structural measures such as concentration, size of firm, product mix, etc., and the performance of markets, than is contained in this study or previous work, these measures are simply not enough evidence to conclude that non-competitive performance is present in a market. The important determinants of market performance and market outcomes in oligopoly theory, i.e., the various oligopoly models including the game theory approach, rest on behavioral conditions relating to the conduct of the participants in a market. This suggests that in merger cases the relevant evidence should be post acquisition evidence. The relevant questions should be:

What conduct is permitted after the merger that was ruled out by competitive pressure before the merger?; What changes in market performance have taken place after the merger?

The administration of such a law requires that mergers be attacked after sufficient evidence has been gathered to answer the questions given above. This requires the merger to settle and the merged company to function, possibly as much as a few years, before regulatory action be taken. This concept has been considered particularly undesirable by other writers because of the costly nature of divestiture as the post merger period lengthens. But the costly nature of divestiture has two effects on merged or merging companies. First, if the merger will have a strong adverse impact on market performance, the probability of a divestiture being required is increased and the merger will be discouraged. Second, if anti-competitive conduct after the merger causes not only a cease and desist order governing the conduct but also a divestiture order there will be present a strong incentive to avoid anti-competitive conduct.

This post acquisition information is extremely pertinent to mergers involving very small shares of a market, e.g., Brown Shoe or Von Grocery, and conglomerate mergers. The Brown Shoe Case involved less than five percent of the market. The court decision had little to do with protecting competition. The divestiture was based on the intent of Congress to protect small, locally owned business (11). The Von Grocery Case involved approximately 10 percent of the market. The relevant facts in the court's divestiture decision was the disappearance of firms in the market. There was no evidence or statement in the decision concerning

the reason for this disappearance. In addition the merged firm was still not the largest firm in the market. The court stated that it was the desire of Congress to have monopoly halted at its incipiency as a justification of its decision (88). Any change in the number and size distribution of firms cannot be considered an increase in monopoly power. The changes in structure or resource reallocation brought about by the competitive mechanism, and this must include aspects of the capital market, must be separated from those changes brought about by monopoly power.

The use of potential effects in merger cases must be a very cautious one until more of the gaps are filled in the triad of structure, conduct, and performance. This caution should increase as cases move from the simpler horizontal market conditions to vertical and conglomerate conditions.

Post acquisition evidence is of vital importance in conglomerate and product extension mergers. The empirical findings of the present work find insufficient evidence of the influence of product extension mergers on market performance to use strict antitrust rules governing their regulation. Thus, changes in market conduct and market performance caused by the merged firm which are anti-competitive in nature must be present rather than merely potential conditions.

Changes in the nature of competition are particularly relevant in product extension cases. The influence of large scale advertising and other forms of non-price competition that might be introduced into an industry that had previously been characterized by price competition

must be considered undesirable if the advertising does not generate a continuous flow of price and quality information. This concept is relevant to the large conglomerates that qualify for advertising discounts and joint product promotion.

In summary, the policy changes suggested are changes that can be made by court interpretation and do not inherently require rewriting the antitrust laws. The changes do not eliminate the often considered inconsistency in the laws relating to internal expansion and merger expansion. The effect a merger has on competition is more drastic in the short run but the differences between external growth and internal growth tend to disappear in the longer run period. A more consistent policy toward mergers such as the policy presented above placing emphasis on conduct and performance and making use of structural elements and the potential results of a change in structure only in the extreme and obvious cases, e.g., cases falling in the extreme mentioned in the Judge Hand quotation above would aleviate some of the inconsistency. This would eliminate many cases where the potential effects are less than obvious and where there is little reason to believe the acceptance of one merger in a market will cause a wave of mergers in the market that are not warranted by competitive aspirations.

CHAPTER VII. CONCLUSIONS

The results of the empirical analysis presented earlier lend little support to the hypothesis being tested. This does not reduce the importance of the results. The hypothesis tested was that the dimensions of market structure and the structure of a firm should have a positive and significant effect on the profitability of the individual firms in the market. The influence on the large firms in the market, the ones that would hold the monopoly if it existed, should be much different than the influence on smaller firms. Similarly, the positive relationship between profitability and monopoly power should be apparent between large firms in "monopolistically" structured industries and large firms in more "competitively" structured industries.

The tests presented earlier indicate very weak relationships between a company's profitability and the concentration of its primary industry, its size, and its diversified activities. These weak relationships do not allow one to disregard the structure-conduct-performance relationships. They do suggest that the existence of certain structural conditions are not sufficient evidence to guarantee monopoly performance. The existence of a significant relationship between these same variables and average gross margin indicate a change in the forms of competition but not necessarily a reduction in competition. The new forms of competition must be evaluated on their own merits. They must be evaluated as substitutes for price competition, not as a lack of total competition. In addition their control, particularly forms of advertising competition, would require changes in the antitrust laws.

This change would be in the form of direct controls of certain activities of which little is known about their economic importance.

There are two critical weaknesses of this study. First, profits are used as a measure of performance and various forms of profitability are the only empirical measures of performance tested. Although profits are the most readily available measure of performance and should have a direct relationship to monopoly resource allocation and monopoly pricing they are a direct measure of neither. Excess profits cannot be separated from normal profits. The influence of dynamic elements on profits cannot be eliminated with certainty in a cross-section analysis. The selection of a suitable time for the cross-section does not allow one to adjust for building programs or product innovations of some firms and not others that would have a significant influence on their profitability.

The choice of a profit measure contributes some additional arbitrariness to the analysis. Some measures of profitability are more suited to particular hypotheses but most measures follow similar distributions (74). The calculation of a profit measure differs among companies as they use different accounting conventions. This data difficulty cannot be corrected in secondary data of the type used above.

The second weakness of this research and possibly a significant factor in the failure to account for many of the differences in levels of profitability among firms that are related to competitive aspects of markets is the failure to consider a number of other important measures effecting market competition. Each of these will be considered.

Markets were considered to be appropriately defined by the Standard Industrial Classification. In the food industries the substitutability

that exists among food products probably calls for a broader classification than the 4-digit classification used. The exceptions might include products such as milk and other baby foods. The classification does not account for the local or national nature of markets but the influence of national corporations in most local or regional markets erases some of this problem. In either case, the secondary data do not allow for the adjustment of either condition without resorting to averages that may further distort the data.

A measure was not incorporated that would have accounted for differences in the structure and conduct of the markets in which the food manufacturing firms purchased inputs. The more competitive the input market, the more influence a dominant firm in an imperfect manufacturing market will have over the determination of input prices.

A similar condition holds for the buyer concentration in the vertically forward market. The more competitive the buyers the more influence the manufacturer has over the price for which he sells his manufactured food product.

The structure of demand for any product in a market has a significant effect on the extent to which a firm can increase the price of its product regardless of its monopoly power. If demand is highly inelastic the monopolist may have sufficient power to significantly enhance price. But if demand is highly elastic a firm with monopolistic control of a product may not have monopolistic control of the market (including substitutes) and thus be limited in the influence it has over price.

The last factor to be mentioned, and possibly the most important of the excluded factors in determining the structure of a firm and in

turn the structure of an industry, is the influence of the capital market. Firms do not just randomly grow to dominance in an industry while others stand still. They grow because they have access to the capital necessary for growth (65). A capital market functioning perfectly will adjust capital availability and charges on the basis of risk. Since different firms in different markets face different levels of risk the cost of capital should vary from market to market causing different rates of return and different commodity prices.

Imperfect capital markets may have a drastic influence on the structure of firms. If capital funds are rationed by size of firm, past performance of the firm or monopolistic power estimates of the firm made by the supplier the influence on market structure as well as on the growth of firms is obvious. Capital could be rationed in such a way as to create monopoly power.

This does not account for the possible influence of internal v. external financing and how rationing if used might influence this trade-off. It does indicate that the structure-conduct-performance relationship is not a one way relationship but a multidirectional relationship with no one segment of the triad being the obvious dependent factor.

These excluded factors were not considered at this time because the hypothesis of the present research was to determine the influence of the commonly used dimensions of firm and market structure on the performance of firms that would be expected to possess monopoly power in a market. The additions of these factors mentioned above to this model should increase the level of explained variability of profit rates but it is not expected that they would account for all variability.

Other factors such as pricing and behavioral conditions, labor strikes, internal operations and organization that are not commonly a part of industrial organization should play a significant role in the determination of profit rates of firms in various markets. These additional factors must be incorporated in the model before the structure-conduct-performance relationships can be disregarded but the influence of conduct and forms of oligopolistic behavior will still play a dominant role in the development of markets and the determination of market performance.

It can be concluded that the diversified firms as a group were no more profitable over time than the nondiversified firms. The diversified firms had greater profit stability and were less prone to extremely high or low profits. Thus, the aversion of risk by diversification seems to be relevant in food manufacturing.

This research leaves much to be done in the area of industrial organization if we are to understand the formation and structure of markets as well as the determinants of market performance. There is an enormous need for data on individual firms of the type classified by the Census Bureau. There is an additional need for consistency in the collection and presentation of data by various government agencies.

The provision of data by individual firms would allow the building of industries into the markets they serve. It would allow more flexibility in the use of different concepts of markets as they relate to different hypotheses.

Of greatest need, however, is the development of theories and models that not only explain the relationship between factors that

influence market performance but that define in a workable fashion performance. The development of concise, testable concepts in this area lags far behind the provision of suitable data.

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APPENDIX A. THE NATURE OF THE COST CURVES FOR THE FOOD INDUSTRIES

The existence of high profit rates in large firms is not absolute evidence of monopoly power. The high profits could be caused by economies in the operation of large firms. This information can be found with the construction of average cost curves and a comparison of average cost curves to profit rates.

The firms under study are multi-product firms requiring an adjusted quantity measure to provide a common denominator for the average cost measures. The denominator chosen was the dollar measure of output to total revenue. Since profits are being viewed as a residual, i.e., profits = TR - TC, any increase in "quasi" average costs, $\frac{TC}{TR}$, must be accompanied by a compensating decrease in the profit rate, $\Pi/_{TR}$. Thus, to test the hypothesis that monopoly exists anytime the profit rate increases without a decrease in average costs requires a shift in the measure of profits to a ratio of profit to net worth. But since no consistent relationship was found between profit to net worth and size of firm it is not surprising that no consistent relationship exists between $TC/_{TR}$ and size of firm.

A number of the average cost curves estimated with linear and quadratic regression equations had positive slopes. The multiple correlation coefficients were consistently non-significant at the 95 percent level indicating that the form of the cost curves was probably not that of a quadratic. The regression coefficients were significantly different from zero for enough of the three digit food processing industry groups to cause alarm. Thus, the concept of average cost

curves for multi-product firms promoted by Carter and Dean was re-evaluated.

Average total cost is being defined as total cost per dollar of sales, $TC/_{TR}$. An increase in the ratio of $TC/_{TR}$ indicates only that the profit margin per unit of sales has declined. It does not necessarily mean that average cost per physical unit of output has declined, nor does it necessarily indicate that the rate of return on invested capital has declined.

Total cost is defined as $\Sigma\ c_i\ \chi_i$, where c_i is the cost per unit of the ith input and χ_i is the amount of the ith input employed. Total revenue is total cost plus total profit or $\Sigma\ p_i\ q_i$, where p_i is the selling price of the ith output and q_i is the quantity sold of the ith output. Increasing average costs defined as above could be caused by an increase in TC with no change in TR, i.e., profits per dollar of sales decline, or by a reduction in p_i with an inelastic demand curve.[43] However, a firm with monopoly power would never lower price in the inelastic range of its demand curve. Since the monopolistic would never produce in the inelastic range of his demand curve, any reduction in his prices in the elastic portion of his demand curve would cause a more than proportionate increase in quantity thus increasing total revenue. This has caused him to move to a new point on his total cost curve which may represent an increase, decrease, or no change in average total costs defined as costs per physical unit of output. If average

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[43] These changes could occur only with non-perfect competition and differentiated products.

cost per physical unit of output is constant, $TC/_{TR}$ will decline because of the increase in TR. But if average cost per physical unit of output is declining, $TC/_{TR}$ may or may not decline depending on (1) the rate of change in total costs and (2) the rate of change in TR which is determined by the elasticity of demand. Thus, for time series analysis there seems to be no straight forward interpretation of $TC/_{TR}$ without information about the elements that make up TR, i.e., price and quantity.

In cross-section analysis firms of different sizes are being related under the assumption that if firm χ is smaller than y, growth of firm χ will cause it to take on the cost structure of y. But since the firms are still of a multi-product nature and sell differentiated products it is impossible to conclude that a higher $TC/_{TR}$ ratio for χ than y means declining average total costs measured in quantity equivalents. If the larger of the firms has monopoly power in any or all of its products the difference could be from monopoly prices rather than lower real average total costs. These facits of the changing ratio cannot be separated without price data and pricing information. Thus, for the purposes of this study the hypotheses concerning cost efficiencies had to be ignored because $TC/_{TR}$ provided only an addition measure of profit margins or price-cost margins and one that was inferior to the average gross margin concept used in the research.

The cost curves derived with the use of total revenue as a weighted measure of output were found to be neither linear nor quadratic for the five 3-digit food industries studied. The ratio of advertising costs to total revenue was positively related to size of firm (measured

by total assets) in the meat products industry. The regression coefficients were significantly different from zero and the coefficient of multiple correlation was significant at the 90 percent level.[44]

The general administrative expenses were significant and positively related to the asset size of firm for canned and frozen fruits and vegetable products, grain mill products, and bakery products. Other measures of costs, i.e., total costs to total revenue and cost of goods sold to total revenue, indicated no significant relationship to the size of firm although the estimates did provide negatively sloped "quasi" average cost curves as would be expected.

The same curves were run for the food processing sector as a whole using the ratio of non-primary to total sales to account for differing levels of product heterogeneity within the firms. Again the changes in "quasi" average costs could not be explained by either a linear or quadratic relationship to size of firm or extent of diversification. Total cost to total revenue displayed a downward sloping relationship to the factors and size of firm played a much more important role than extent of diversification. General administrative expenses (or overhead) to total revenue displayed a positive relationship to size and diversification but in this case the extent of diversification played the dominant role. This could possibly be evidence that overhead expenses increase in diversified operations, i.e., diversification does not cause economies of scale in such operations as management.

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[44]The best fit was with a quadratic relationship in which multiple R^2 was .62.

Thus, the lack of any consistent relationship between size and these cost curves is consistent with the lack of a relationship between profit rates and size of firm. The cost measures seem to be of little additional use.

It should be emphasized that in addition to the weaknesses pointed out in the Carter-Dean cost curves, accounting data obtained from secondary sources of the type used in this study are very poor. Even though at an aggregative level the accounts should provide some degree of consistency from one firm to another, there are enough differences in accounting techniques to greatly weaken the usefulness of the data for cost studies.

Thus, the cost analysis that was intended to provide support to and yield further evidence of monopoly power or lack of monopoly power proved to be of little use because of the lack of relationships and the weaknesses of the measures.

APPENDIX B. DATA USED IN THE SURVIVAL TECHNIQUE TO DETERMINE THE MINIMUM EFFICIENT SIZE PLANT

Table 15. Change in the percentage share of value added, by employment size class of establishments in food manufacturing, 1954 to 1964 (in percent)[c]

SIC	Industry	Total value added[b]	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
20	Total food and kindred products										
	1963	100.0	3.3	4.7	12.2	14.9	26.4	16.6	14.7	5.3	1.8
	1954	100.0	4.0	5.1	12.3	15.6	26.1	15.1	11.1	7.5	3.1
	Change 1954-63		-.7	-.4	-.1	-.7	+.3	+1.5	+3.6	-2.2	-1.3
2011	Meat slaughtering plants										
	1963	100.0	3.2	3.1	8.3	8.6	14.4	13.0	13.2	17.8	18.4
	1958	100.0	3.8	3.0	8.0	8.0	12.5	13.5	10.8	21.5	19.1
	1954	100.0	2.2	2.6	7.2	8.2	12.6	11.1	13.1	15.9	27.0
	Change 1954-63		+1.0	+.5	+1.1	+.4	+1.8	+1.9	+.1	+1.9	-8.6
2013	Meat processing plants										
	1963	100.0	3.9	5.8	14.5	15.2	33.7	16.6	10.3	---[a]	
	1958	100.0	7.1	7.5	16.6	17.4	28.4	13.7	9.4	---[a]	
	1954	100.0	5.0	6.8	15.0	18.3	26.3	14.8	4.7	9.1	
	Change 1954-63		-1.1	-1.0	-.5	-3.1	+7.4	+1.8	-3.5	---[a]	

[a]Data has been withheld to avoid disclosure. Data are included in next smaller size class.

[b]Note:--Figures may not add due to rounding.

[c]Source: (58, pp. 248-253).

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2015	Poultry dressing plants										
	1963	100.0	2.2	2.4	7.8	14.5	45.2	21.0	6.9		
	1958	100.0	3.7	3.5	8.9	22.8	41.3	19.9	---[a]		
	1954	100.0	7.0	5.1	14.9	22.9	41.5	8.7	---[a]		
	Change 1954-63		-4.8	-2.7	-7.1	-8.4	+3.7	+19.2	---[a]		
2021	Creamery butter										
	1963	100.0	19.1	13.8	32.2	21.2	13.7				
	1958	100.0	18.1	14.9	27.5	16.8	16.6	6.0			
	1954	100.0	14.1	16.0	24.9	17.9	16.4	10.8			
	Change 1954-63		+5.0	-2.2	+7.3	+3.3	-2.7	-10.8			
2022	Natural and process cheese[d]										
	1963	100.0	14.2	12.2	21.1	16.9	18.7	16.9	---[a]		
	1958	100.0	22.0	13.7	21.0	16.6	15.5	11.1		---[a]	
	1954	100.0	15.7	12.2	24.4	22.6	25.2	---[a]		---[a]	
	Change 1954-63		-1.5	0	-3.3	-5.7	+10.4	---[a]	---[a]	---[a]	
2023	Condensed and evaporated milk										
	1963	100.0	1.7	3.7	18.1	33.0	43.5	---[a]			
	1958	100.0	2.1	2.9	20.3	42.0	32.8				
	1954	100.0	3.3	6.0	19.5	39.7	31.5	---[a]			
	Change 1954-63		-1.6	-2.3	-1.4	-6.7	+12.0	---[a]			

[d]Data prior to 1963 has been adjusted to include special dairy products.

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2024	Ice cream and frozen desserts										
	1963	100.0	4.1	7.0	23.7	26.6	30.2	8.5			
	1958	100.0	4.6	7.7	21.5	26.8	23.9	15.6	---[a]		
	1954	100.0	5.6	9.2	21.8	26.1	22.5	8.4	6.3		
	Change 1954-63		-1.5	-2.2	+1.9	+.5	+7.7	-6.2	---[a]		
2026	Fluid milk[e]										
	1963	100.0	3.5	4.7	14.3	19.7	34.5	15.3	6.8	---[a]	
	1958	100.0	4.2	5.6	15.9	20.2	28.2	17.9	8.0		
	1954	100.0	2.6	6.5	15.4	18.9	28.7	16.3	7.9	---[a]	
	Change 1954-63		+1.1	-1.8	-1.0	+.8	+5.8	-1.0	-.9	---[a]	
2031	Canned and cured seafoods[f]										
	1963	100.0	2.9	5.1	20.1	18.4	15.4	13.0	25.1	---[a]	
	1958	100.0	3.7	3.7	17.7	19.9	9.6	16.8	28.7	---[a]	
	1954	100.0	3.3	3.9	14.9	21.3	13.2	17.2	26.2	---[a]	
	Change 1954-63		-.4	+1.2	+5.2	-2.9	+2.2	-4.2	-1.1	---[a]	

[e]Data prior to 1958 has been adjusted to include fluid milk and other products.

[f]Data prior to 1958 has been adjusted to include canned seafood and cured fish.

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2032	Canned specialties[g]										
	1963	100.0	.4	.4	1.9	1.7	5.2	20.0	70.3	---[a]	---[a]
	1958	100.0	.2	.4	1.5	2.1	6.6	16.5	72.6	---[a]	---[a]
	1954	100.0	NA[h]	NA	NA	NA	NA	NA	NA	NA	NA
	Change 1958-63		+.2	0	-.4	-.4	-1.4	+3.5	-2.3	---[a]	---[a]
2033	Canned fruits and vegetables										
	1963	100.0	1.2	2.7	7.8	12.8	33.3	22.5	13.4	6.2	---[a]
	1958	100.0	1.4	3.0	9.5	14.2	29.6	23.5	18.6	---[a]	---[a]
	1954	100.0	1.4	1.9	8.3	11.7	26.0	16.1	14.0	20.5	---[a]
	Change 1954-63		-.2	+.8	-.5	+.9	+7.3	+6.4	-.6	-14.3	---[a]
2034	Dehydrated food products										
	1963	100.0	2.6	4.0	8.9	14.0	17.1	38.8	14.7		
	1958	100.0	3.9	8.5	13.4	12.9	31.8	29.5	---[a]		
	1954	100.0	2.7	3.5	12.0	10.3	49.7	21.8	---[a]		
	Change 1954-63		-.1	+.5	-3.1	+3.7	-32.6	+31.7	---[a]		
2035	Pickles, sauces, salad dressings										
	1963	100.0	3.4	5.3	11.9	12.3	31.4	35.7	---[a]		
	1958	100.0	4.9	5.6	13.6	15.9	22.8	37.2	---[a]		
	1954	100.0	6.3	5.7	13.1	14.9	27.5	32.5	---[a]		
	Change 1954-63		-2.9	-.4	-1.2	-2.6	+3.9	+3.2	---[a]		

[g]Most establishments classified in this industry in 1958 were classified in canned fruits and vegetables.

[h]NA:--Not available.

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2036	Fresh or frozen packaged fish										
	1963	100.0	5.6	8.1	19.4	16.1	28.2	14.0	8.7		
	1958	100.0	5.2	6.9	19.4	20.2	26.6	21.6	---[a]		
	1954	100.0	5.0	7.9	15.6	21.2	28.1	22.1	---[a]		
	Change 1954-63		+.6	+.2	+3.8	-5.1	+.1	+.6	---[a]		
2037	Frozen fruits and vegetables										
	1963	100.0	1.6	2.1	6.7	12.2	30.2	19.8	27.4	---[a]	
	1958	100.0	.9	2.3	6.9	11.6	35.4	18.9	24.0	---[a]	
	1954	100.0	1.2	1.4	5.6	16.7	36.2	16.1	22.8	---[a]	
	Change 1954-63		+.4	+.7	+1.1	-4.5	-6.0	+3.7	+4.6	---[a]	
2041	Flour mills										
	1963	100.0	3.0	3.1	10.4	20.4	39.5	15.8	7.7		
	1958	100.0	2.9	2.4	10.6	18.6	39.7	17.2	8.4	---[a]	
	1954	100.0	3.0	2.6	8.3	18.1	40.2	11.2	16.6	---[a]	
	Change 1954-63		0	+.5	+2.1	+2.3	-0.7	+4.6	-8.9	---[a]	
2042	Prepared animal feeds										
	1963	100.0	7.1	10.8	23.2	21.4	23.3	14.2	---[a]		
	1958	100.0	6.7	9.1	19.4	20.3	32.0	12.6	---[a]		
	1954	100.0	5.8	7.2	16.2	16.8	38.3	15.6	---[a]		
	Change 1954-63		+1.3	+3.6	+7.0	+4.6	-15.0	-1.4	---[a]		
2043	Cereal preparations										
	1963	100.0	.4	---[a]	11.4	---[a]	---[a]	12.4	75.8	---[a]	---[a]
	1958	100.0	.4	---[a]	2.9	1.7	6.5	11.4	77.1[a]	---[a]	---[a]
	1954	100.0	.2	.3[a]	2.3	1.7	7.6	23.5	---[a]	64.5	---[a]
	Change 1954-63		-.1	---[a]	- .2	---[a]	---[a]	+.2	---[a]	---[a]	---[a]

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-499	1,000-2,499	2,500+
2044	Rice milling										
	1963	100.0	1.9	4.7	10.9	21.8	60.8	---[a]			
	1958	100.0	1.2	4.2	13.8	34.1	46.7				
	1954	100.0	1.1	1.8	24.0	42.0	31.1	---[a]			
	Change 1954-63		+.6	+2.9	-13.1	-20.2	+29.7	---[a]			
2045	Blended and prepared flour										
	1963	100.0	2.0	1.6	6.7	16.0	26.9	46.9	---[a]		
	1958	100.0	2.0	2.7	6.0	6.6	13.8	68.9	---[a]		
	1954	100.0	2.4	1.9	5.4	10.0	80.4	---[a]	---[a]		
	Change 1954-63		-.4	-.3	+2.3	+6.0	-6.6	---[a]	---[a]		
2046	Wet corn milling										
	1963	100.0	.8	.4	.8	13.7	---[a]	---[a]	19.5	64.8	---[a]
	1958	100.0	.5	1.1	1.3	1.4	---[a]	10.3	14.5	70.9	---[a]
	1954	100.0	.6	.7	1.2	1.6		10.1	21.6	64.2	---[a]
	Change 1954-63		+.2	-.3	-.4	+2.0	---[a]	---[a]	-2.1	+.6	---[a]
2051	Bread and related products										
	1963	100.0	2.2	2.7	7.1	13.2	36.0	24.0	11.1	3.7	---[a]
	1958	100.0	2.8	3.7	8.7	15.3	34.9	20.1	9.7	4.7	---[a]
	1954	100.0	3.9	3.6	9.0	17.3	32.7	19.5	10.1	3.9	
	Change 1954-63		-1.7	-.9	-1.9	-4.1	+3.3	+4.5	+1.0	-.2	---[a]
2052	Biscuit, crackers and cookies										
	1963	100.0	.6	.7	4.1	4.6	10.5	6.9	39.5	33.2	---[a]
	1958	100.0	.4	.8	3.5	5.5	10.5	12.7	37.7	28.8	---[a]
	1954	100.0	.4	.8	2.1	3.5	11.7	10.9	70.6	---[a]	---[a]
	Change 1954-63		+.2	-.1	2.0	+1.1	-1.2	-4.0	+2.1	---[a]	---[a]

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees: 1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2061	Raw cane sugar										
	1963	100.0		8.4	---[a]	20.9	50.5	20.2		---[a]	
	1958	100.0	.6		19.6	44.3	35.5	---[a]			
	1954	100.0	1.2	---[a]	25.3	48.0	25.5	---[a]			
	Change 1954-63		---[i]	-18.1	---[a]	-27.1	+35.2	---[a]		---[a]	
2062	Cane sugar refining										
	1963	100.0			2.4	2.8	---[a]	17.8	77.1	---[a]	
	1958	100.0	.1	---[a]	2.3		---[a]	9.0	37.0	51.7	
	1954	100.0			12.2	---[a]		---[a]	28.8	59.0	
	Change 1954-63				+10.8	---[a]		---[a]	-10.7	---[a]	
2063	Beet sugar										
	1963	100.0	2.8		---[a]	---[a]	65.1	32.1	---[a]		
	1958	100.0			6.2	---[a]	77.1	16.1	---[a]		
	1954	100.0			3.0	---[a]	75.2	21.8	---[a]		
	Change 1954-63		-.2		---[a]	---[a]	-10.1	+10.3	---[a]		
2071	Confectionary products										
	1963	100.0	2.5	3.1	7.0	11.4	20.2	19.5	16.0	20.2	
	1958	100.0	3.0	3.5	6.7	11.5	17.9	17.6	15.5	24.3	
	1954	100.0	2.7	3.1	8.2	11.4	20.4	17.1	9.9	27.1	
	Change 1954-63		-.2	0	-1.2	0	-.2	+2.4	+6.1	-6.9	

[i] Data has been withheld to avoid disclosure. Data are included in next larger size class.

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2072	Chocolate and cocoa products										
	1963	100.0	.6	---[a]	---[a]	5.3	11.6	7.9	74.6	---[a]	---[a]
	1958	100.0	2.7	---[a]	---[a]	12.8	---[a]	10.0	74.3	---[a]	---[a]
	1954	100.0	2.6	---[a]	.9	7.0	13.0	76.5	---[a]	---[a]	---[a]
	Change 1954-63		-2.9	---[a]	---[a]	-1.7	-1.4	+5.9	---[a]	---[a]	---[a]
2073	Chewing gum										
	1963	100.0	0.8	---[a]	0.4	1.4	25.4	---[a]	72.0	---[a]	
	1958	100.0	.2	0.8	1.2	---[a]	9.2	17.7	71.0	---[a]	
	1954	100.0	.5	.8	---[a]	1.3	5.8	13.6	78.0	---[a]	
	Change 1954-63		-.1	---[a]	---[a]	+.1	+6.0	---[a]	-6.0	---[a]	
2086	Bottled and canned soft drinks										
	1963	100.0	4.1	11.4	27.9	20.2	23.9	9.0	3.3		
	1958	100.0	7.1	14.2	29.7	20.7	18.0	7.9	2.4		
	1954	100.0	9.6	15.3	28.9	17.3	18.9	10.0		---[a]	
	Change 1954-63		-5.5	-2.9	-1.0	+2.9	+5.0	+2.3	---[a]	---[a]	
2087	Flavorings										
	1963	100.0	4.8	9.8	16.7	30.4	16.2	22.0	---[a]		
	1958	100.0	5.0	8.6	15.2	29.8	21.3	20.1			
	1954	100.0	6.2	6.0	15.0	40.9	13.3	18.5			
	Change 1954-63		-1.4	+3.8	+1.7	-10.5	+2.9	+3.5	---[a]		
2091	Cottonseed oil mills										
	1963	100.0	.4	5.4	35.7	30.7	27.8	---[a]			
	1958	100.0	.8	3.8	38.3	30.2	26.9				
	1954	100.0	.8	3.7	27.4	38.4	29.8	---[a]			
	Change 1954-63		-.4	+1.7	+8.3	-7.7	-2.0	---[a]			

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees 1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2092	Soybean oil mills										
	1963	100.0	2.1	3.7	13.6	43.0	9.3	28.4			
	1958	100.0	.7	1.5	19.4	31.8	16.4	30.1	---[a]		
	1954	100.0	.6	.6	10.6	34.3	12.3	41.5	---[a]		
	Change 1954-63		+1.5	+2.1	+3.0	+8.7	-3.0	-13.1	---[a]		
2093	Vegetable oil mills, n.e.c.[j]										
	1963	100.0	2.2	3.1	13.2	30.0	51.5				
	1958	100.0	1.5	2.5	4.6	21.6	69.8	---[a]			
	1954	100.0	3.7	3.9	8.9	19.8	63.7	---[a]	---[a]		
	Change 1954-63		-1.5	-.8	+4.3	+10.2	-12.2	---[a]	---[a]		
2094	Animal and marine fats and oils[k]										
	1963	100.0	6.9	14.8	31.3	21.2	25.9	---[a]			
	1958	100.0	7.7	14.2	28.6	24.6	14.2	10.8	---[a]		
	1954	100.0	8.1	13.7	28.5	19.9	17.3	12.5	---[a]		
	Change 1954-63		-1.2	+1.1	+2.8	+1.3	-3.9	---[a]	---[a]		

[j]Data prior to 1958 has been adjusted to include lindseed oil mills and vegetable oil mills, n.e.c.

[k]Data prior to 1963 has been adjusted to include grease and tallow and animal oils, n.e.c.

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2096	Shortening and cooking oils[1]										
	1963	100.0	.6	.6	5.3	12.1	43.8	18.4	19.2	---[a]	
	1958	100.0	.3	1.0	4.0	13.0	38.8	27.4	15.6		
	1954	100.0	3.1	2.1	---[a]	11.6	56.8	26.4	---[a]		
	Change 1954-63		-2.5	+3.2	---[a]	+.5	-13.0	+11.2	---[a]	---[a]	
2095	Roasted coffee[m]										
	1963	100.0	1.4	1.9	8.5	10.2	20.7	19.3	37.9	---[a]	
	1958	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	1954	NA	NA	NA	NA	NA	NA	NA	NA	NA	
2097	Manufactured ice										
	1963	100.0	26.5	28.1	34.1	11.3	---[a]				
	1958	100.0	26.9	25.8	32.3	9.6	5.4				
	1954	100.0	27.2	24.7	32.7	10.0	5.9	---[a]			
	Change 1954-63		-.7	+3.4	+2.0	-4.6	---[a]	---[a]			
2098	Macaroni and spaghetti										
	1963	100.0	3.4	4.1	9.7	15.6	42.7	24.4			
	1958	100.0	3.8	3.8	13.4	22.2	41.3	15.6			
	1954	100.0	5.3	3.4	15.7	22.2	36.1	17.3			
	Change 1954-63		-1.9	+.7	-6.0	-6.6	+6.6	+7.1			

[1]Data prior to 1958 has been adjusted to include margarine.

[m]Prior to 1963, coffee roasting was not classified as a separate industry, but was classified as part of food preparations, n.e.c.

Table 15. (continued)

SIC	Industry	Total value added	Size class, number of employees								
			1-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500+
2099	Food preparations, n.e.c.[n]										
	1963	100.0	3.8	4.4	12.6	13.0	24.0	20.8	20.7	---[a]	
	1958	100.0	5.0	5.3	12.8	13.4	27.7	21.9	13.8	---[a]	
	1954	100.0	4.4	5.4	11.4	12.3	30.1	18.3	18.1	---[a]	
	Change 1954-63		-.6	-1.0	+1.2	+.7	-6.1	+2.5	+2.6	---[a]	

[n]Data includes coffee roasting.

APPENDIX C. DISTRIBUTIONS OF PROFIT RATES, DIVERSIFICATION, AND CONCENTRATION BY SIZE OF FIRM FOR SAMPLE USED IN REGRESSION ANALYSIS

Table 16. Distribution of profit to net worth by size of firm

Assets size (millions)	Profit/net worth						
	Less than 0	0-.05	.051-.10	.11-.15	.16-.20	.21-.25	over .25
0-10	8	9	7	10	3		1
10-25	1	8	6	3	3	1	2
25-50	1	1	7	5	5		
50-100	3	2	7	4	1		
100-250	1	2	10	4	2	1	
250-500		1	2	7	2		
500-1,000		2	1	2	2		

Table 17. Distribution of the extent of product diversification by size of firm

Assets size (millions)	Diversification nonprimary sales/total sales								
	0	.01-.10	.11-.20	.21-.30	.31-.40	.41-.50	.51-.60	.61-.70	Over .70
0-10	24	1							
10-25	10	2			1	1			
25-50	3	2		1	2	2	1		
50-100	5	3	6	1	2	2	1		
100-250	1		4	3	2	1	2	1	2
250-500		1	2		2	1	4		2
500-1,000					2	1	1	1	2

Table 18. Distribution of diversified power index by size of firm

Assets size (millions)	Index of diversified power							
	0-.10	.11-.20	.21-.30	.31-.40	.41-.50	.51-.60	.61-.70	.71-.80	Over .80
0-10		7	10	4		1	2		
10-25		5	4	4	1			1	
25-50		3	3	5				1	
50-100		5	5	3	1	2	2		
100-250		2	8	2	1	2	1		
250-500		2	4	2	3			1	
500-1,000		1	3	1		1	1		

Table 19. Distribution of primary industry concentration by size of firm

Assets size (millions)	Primary industry 4-firm concentration ratios									
	.0-.10	.11-.20	.20-.30	.31-.40	.41-.50	.51-.60	.61-.70	.71-.80	.81-.90	.91-1.00
0-10		5	11	3	1	3	2			
10-25		3	4	5	1			1		
25-50			2	7	1	2		1		
50-100			6	4	2	2	2	1		
100-250		1	3	6	2	2	1		3	
250-500		1	5	3			1			
500-1,000		3	2	2						